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A TEXT-BOOK

OF

OBSTETRICS

INCLUDING THE

PATHOLOGY AND THERAPEUTICS
OF THE PUERPERAL STATE.

DESIGNED FOR

PRACTITIONERS AND STUDENTS OF MEDICINE.

BY

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SUPREME MEDICAL COUNCIL, AND OF THE FACULTY OF MEDICINE IN
THE UNIVERSITY OF MUNICH.

TRANSLATED FROM THE FIRST GERMAN EDITION,

WITH PERMISSION OF THE AUTHOR, UNDER THE SUPERVISION OF

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PREFACE.

The present work was written between the years 1882 and 1888, at the instigation of the publishers, while the author was living in Dresden. It was put in type in the summer of 1887, and for this reason the literature referred to in the first half of the book dates up to the spring of 1887 only, while in the second half the more recent authorities have been utilized. The illustrations, with the exception of about twenty-five, depicting instruments, are entirely new, and after original drawings executed with great care, by C. Krapf, the University draughtsman. A number of them were procured for me by Dr. R. Ziegenspeck, to whom I am greatly indebted for this favor. The material upon which this book is based was obtained partly from the Royal Charity Hospital (1859–60–61), and partly from the Royal University Obstetrical Clinic of Berlin (1861–1864); furthermore, from the Rostock Clinics (1864–1872), Dresden (1872–1883), and Munich (1883–1888). It also includes cases seen in my own private practice, as well as in that of my grandfather and father. These observations embrace a series of more than twenty thousand cases, more than six hundred of which are purely operative, occurring in my father's practice, while 17,200 are taken from the clinics conducted by me since 1864.

For the past five years my summer lectures have included Parts I to V (½) as here given, while Part VI was delivered in winter in connection with the operation course. I do not believe that I have exceeded the limits of a text-book in these lectures. The pathology and management of labor are, of course, the prominent features of this work; in accordance with the title, however, the remaining parts of the book have been treated in a manner corresponding to their importance. The oft repeated request for themes for dissertations has assisted me in the selection of the literature. It is a frequent and just complaint that the history of medicine from its beginning is very often neglected, not only by students, but also by authors in our branch of medical science. For this reason I have given this subject more space than usual. Where detailed quotations are used, they have been personally procured by me from the original. Certain anomalous cases are not supported by sufficient data to enable the student to easily get at the gist of the subject matter. Out of consideration for the student, such material has been more thoroughly gone into than is usually the case in text-books, in order to render its perusal more pleasant, and the utilization of analogous observations easier.

PREFACE.

I have been ably supported by many of my assistants
this work. I am especially indebted in this respect to
Ashton, Lesner and Eisenhart, of Munich. May this
circle of readers, and may it thoroughly stimulate and
with benefit to himself as well as to the women and
professional assistance.

F.

TRANSLATOR'S NOTE.

In the present work, my aim has been to faithfully and accurately reproduce in English Professor Winckel's Text-Book of Obstetrics. How far success has attended the undertaking must be left to those capable of judging to decide. If some of the passages in the translation read somewhat stiffly, and upon comparison with the original these sentences are found to be rather literal in the rendering of them into English, the explanation offered is, that where in a given passage the question arose between style on the one hand, and precision upon the other, the choice has invariably been in favor of the latter.

Nothing contained in the original text has, intentionally, been omitted, and nothing, with the exception of two illustrations, has been introduced into the American edition.

It will be noted that the temperature markings of the original text have, for convenience sake, been converted from the Centigrade and Réaumur scales into those of Fahrenheit. The weights and measures have been retained in the original decimal system.

To my friend, Dr. Irwin H. Hance, of this city, I am indebted for the translation of a part of the work, and for much valuable assistance in the revision of portions of the manuscript.

In the Spring and Summer of 1888, while serving as interne under Prof. Winckel in the Royal Frauen Klinik of Munich, and while the German edition of the present text-book was passing through the press, it was my privilege to examine most of the original drawings contained in the work, and to inspect many of the anatomical specimens from which these illustrations were drawn.

It has been with many pleasant and grateful recollections of Professor Winckel's numerous acts of kindness and courtesy, during my late residence in the Bavarian Maternity, as his pupil and interne, that this somewhat arduous task has been cheerfully undertaken and carried to its completion.

J. CLIFTON EDGAR.

115 East 35th Street,
New York City, December 30th, 1889.

111999

CONTENTS.

PAGE

HISTORICAL INTRODUCTION, ... 17

PART I.

PHYSIOLOGY AND MANAGEMENT OF PREGNANCY.

SECTION I.

ANATOMY AND PHYSIOLOGY.

CHAPTER I.

Definition—Commencement of Pregnancy—Time and Site of Fecundation, ... 33

CHAPTER II.

Impregnation and the Changes in the Ovum in the First Four Weeks, ... 36

CHAPTER III.

Formation of the Placenta—The Membranes of the Ovum and the First Changes in the Uterus and the Adjacent Organs, ... 39

CHAPTER IV.

The Further Development of the Embryo and the Fœtal Membranes in Pregnancy . . 45

CHAPTER V.

The Fully-developed Child, ... 51

CHAPTER VI.

The Umbilical Cord, Funiculus Umbilicalis, ... 54

CHAPTER VII.

The Placenta, ... 56

CHAPTER VIII.

The Liquor Amnii, ... 62

CHAPTER IX.

The Nutrition and Metabolism of the Embryo and Fœtus, ... 65

CHAPTER X. PAGE
Further Changes in the Uterus and the other Genital Organs, ... 68

CHAPTER XI.
Changes caused by Pregnancy in other Organs of the Body, ... 74

SECTION II.

SYMPTOMATOLOGY OF PREGNANCY.

CHAPTER I.
The Appearance of the Genitals in the Different Months of Pregnancy, ... 79

CHAPTER II.
The Milder Disorders of Pregnancy, ... 81

CHAPTER III.
The Position of the Child in Utero, ... 84

CHAPTER IV.
The Auscultatory Phenomena of Pregnancy, ... 88

CHAPTER V.
The Duration of Pregnancy, ... 93

SECTION III.

THE EXAMINATION FOR PREGNANCY AND ITS DIAGNOSIS.

CHAPTER I.
General Remarks—Obstetric History, ... 95

CHAPTER II.
The Obstetric Examination, ... 97

CHAPTER III.
Relative Value of the Different Signs of Pregnancy, ... 107

CHAPTER IV.
Differential Diagnosis of Pregnancy and Certain Morbid Conditions, ... 109

CHAPTER V.
Diagnosis between Primipara and Multipara—The Determination of the Exact Period of Pregnancy and the Size of the Child, ... 112

SECTION IV.

MULTIPLE PREGNANCY.

CHAPTER I.

PAGE
Occurrence—Manner of Impregnation—Development of the Ovum, ... 114

CHAPTER II.

Symptomatology and Diagnosis of Twin Pregnancy, ... 120

SECTION V.

THE MANAGEMENT OF PREGNANCY.

CHAPTER I.

Nourishment—Clothing—Bodily and Mental Occupation—Care of the Skin—Preparation of the Genitals for Labor and the Puerperal State, ... 123

CHAPTER II.

Antiseptic Precautions as a Preparation for Labor, ... 125

CHAPTER III.

The Treatment of the Milder Disorders of Pregnancy, ... 126

PART II.

PHYSIOLOGY AND MANAGEMENT OF LABOR.

CHAPTER I.

Definition—Motor Nerve Centre of the Uterus—Causes of Labor, ... 129

CHAPTER II.

The Expelling Forces, ... 133

CHAPTER III.

The Obstacles to be Overcome during Labor, ... 138

CHAPTER IV.

The Phenomena of Labor—The Stages of Labor, ... 144

CHAPTER V.

The Mechanism of Labor—Frequency of the Different Presentations—Course of Labor in Vertex Presentations, ... 153

CHAPTER VI.

Abnormal Mechanism in Vertex Presentations, ... 158

CHAPTER VII.

Face Presentation, ... 161

CHAPTER VIII.

PAGE
Pelvic Presentations—Breech—Foot—Knee, ... 169

CHAPTER IX.

Prognosis of the Different Presentations, ... 174

CHAPTER X.

Labor in Multiple Pregnancies, ... 176

CHAPTER XI.

The Management of Labor—General Directions, ... 177

CHAPTER XII.

The Management of Labor—Special Directions, ... 180

CHAPTER XIII.

The Use of Anæsthetics in Labor, ... 186

CHAPTER XIV.

The Treatment of the Third Stage of Labor, ... 189

CHAPTER XV.

The Management of Twin Labors, ... 194

CHAPTER XVI.

The Care of the Child Immediately after Delivery, ... 194

PART III.

THE PHYSIOLOGY AND MANAGEMENT OF THE PUERPERAL STATE.

CHAPTER I.

Anatomical Changes in the Genital Organs, ... 197

CHAPTER II.

The Phenomena Observed in the Healthy Puerpera, ... 203

CHAPTER III.

The Diagnosis of the Puerperal Condition, ... 210

CHAPTER IV.

Changes in the Child after Birth, ... 211

CHAPTER V.

The Care of the Puerperal Woman, ... 213

CHAPTER VI.

The Care of the New-born Infant, ... 218

PART IV.

PATHOLOGY AND THERAPEUTICS OF PREGNANCY.

PAGE
INTRODUCTION, ... 223

SECTION I.

AFFECTIONS OF THE SEXUAL ORGANS.

CHAPTER I.

Nutritive Disturbances of the Vulva, Vagina and Cervix—Vulvitis, Colpitis, Endometritis Gravidarum, Mycosis Vaginæ and Colpohyperplasia Cystica, ... 226

CHAPTER II.

Displacements of the Genital Organs—Inversion of the Vagina, Descensus and Prolapsus of the Gravid Uterus, ... 228

CHAPTER III.

Retroversion and Retroflexion of the Pregnant Uterus, ... 233

CHAPTER IV.

Ante-displacement of the Uterus and Pendulous Abdomen—(Anteversio et Anteflexio Uteri Gravidi—Venter Propendens), ... 241

CHAPTER V.

Hernia of the Pregnant Uterus—Hernia Uteri Gravidi—Hysterocele, ... 244

CHAPTER VI.

Pregnancy Complicated by Ovarian Tumor, ... 248

SECTION II.

DISEASES OF PREGNANCY OUTSIDE OF THE GENITAL ORGANS.

CHAPTER I.

Salivation, ... 250

CHAPTER II.

Inflammation of the Gums—Gingivitis, ... 251

CHAPTER III.

Parotitis, ... 251

CHAPTER IV.

Persistent Vomiting of Pregnant Women—(Hyperemesis Gravidarum), ... 252

CHAPTER V.

Affections of the Liver, ... 255

CHAPTER VI.

PAGE
Typhoid Fever, ... 257

CHAPTER VII.

Dermato-mycosis Furfuracea—Pityriasis Versicolor, ... 258

CHAPTER VIII.

Acute Exanthemata, ... 259
    (A) Measles, ... 259
    (B) Scarlet Fever—Scarlatina, ... 259
    (C) Smallpox—Variola, ... 260

CHAPTER IX.

Anæmia, ... 260

CHAPTER X.

Pulmonary Tuberculosis, ... 261

CHAPTER XI.

Cardiac Diseases in Pregnancy, ... 263

CHAPTER XII.

Secondary Syphilis, ... 265

CHAPTER XIII.

Affections of the Eyes, ... 267

CHAPTER XIV.

Affections of the Nervous System, ... 268

SECTION III.

ANOMALIES AND DISEASES OF THE FŒTUS IN PREGNANCY.

CHAPTER I.

Extra-uterine Pregnancy (Graviditas extrauterina), ... 271

CHAPTER II.

Diseases of the Fœtal Membranes:—

(*a*) Endometritis Membranæ Deciduæ Veræ—Hydrorrhœa Uteri Gravidi, . . . 288
(*b*) Endometritis Polyposa, ... 290
(*c*) Atrophy of the Decidua Vera, ... 291
(*d*) Formation of Cysts in the Decidua Vera, ... 292
(*e*) Apoplexy of the Decidua Vera—Abortion, ... 292

CHAPTER III.

Diseases of the Chorion—The Hydatiform or Vesicular Mole—Myxoma Chorii Multiple—Mola Hydatidosa, ... 302

CHAPTER IV.

PAGE
Excess of Liquor Amnii—Hydramnios, ... 306

CHAPTER V.

Abnormally Small Amount of Liquor Amnii—Amniotic Adhesions, ... 310

CHAPTER VI.

Disturbances of Pregnancy due to an Abnormal Situation of the Placenta, ... 311

CHAPTER VII.

Premature Detachment of the Placenta during Pregnancy, its Site being Normal, . . . 328

CHAPTER VIII.

Disturbances of Pregnancy due to Disease of the Placenta and the Umbilical Cord—Death of the Fœtus—Partus Immaturus and Præmaturus, ... 329

CHAPTER IX.

Injuries to and Operations upon Pregnant Women, ... 334

PART V.

PATHOLOGY AND THERAPEUTICS OF LABOR.

SECTION I.

DISTURBANCES OF LABOR ON THE PART OF THE FŒTUS.

CHAPTER I.

Faulty State of the Membranes during Labor.

1. The Immature and Premature Rupture of the Membranes, ... 337
2. Excessive Resistance of the Fœtal Membranes, ... 343

CHAPTER II.

Anomalies of Labor due to a Faulty Condition of the Umbilical Cord.

1. Faulty Form and Vascular Arrangement of the Umbilical Cord, ... 345
2. Abnormal Insertion of the Umbilical Cord, ... 346
3. Abnormal Length and Knotting of the Umbilical Cord, ... 352
4. The too Short Umbilical Cord, ... 354
5. Shortening of the Cord by Coiling, ... 356
Appendix.—Spontaneous Amputation of the Fœtus, so-called, ... 360
6. Lesions of the Umbilical Cord occurring during Labor, ... 361
7. Parenchymatous Changes in the Cord, ... 364
8. New Growths of the Umbilical Cord, ... 365
9. Presentation and Prolapse of the Umbilical Cord, ... 366

CHAPTER III.

Disturbances of Labor due to a Faulty State of the Child:— PAGE
1. Faulty Attitude of the Fœtus, ... 380
2. Faulty Position of the Fœtus—Faulty Mechanism of Labor in Vertex and Face Presentations—Incomplete Flexion of Head—Occipito-posterior Positions—Brow Positions—Face Positions, with the Chin turned backward, ... 390
3. Faulty Presentation of the Fœtus, ... 397

CHAPTER IV.

Disturbances of Labor due to a Faulty Shape of the Child in Consequence of Diseases, Deformities and Faulty Size:—
(A) In Consequence of a Faulty Condition of its Head.
1. Hydrocephalus, ... 419
2. Hydromeningocele, Hydrencephalocele, Intrafœtatio Capitis, ... 427
(B) In Consequence of New Growths of the Neck.
1. Cystic Hygroma, ... 430
2. Goitre, ... 431
(C) Disturbances of Labor due to a Faulty Condition of the Thorax, ... 433
(D) Disturbances of Labor due to a Faulty Condition of the Child's Abdomen, . 436
(E) Tumors of the Posterior Sacral Region as Obstacles to Delivery, ... 442

CHAPTER V.

Disturbances of Labor due to the Presence of several Fœtuses in the Uterus, ... 446
1. Faulty Mechanism of Labor with Twins, ... 446
2. Interlacing and Knotting of the Umbilical Cord, ... 448
3. Double Monstrosities, ... 450

SECTION II.

ANOMALIES OF LABOR DEPENDENT ON THE MOTHER.

CHAPTER I.

Disturbances of Labor Due to Faulty Structure of the Female Pelvis, ... 456
History, ... 457
(a) Narrow Pelvis without Change of Form, ... 465
I. Uniformly Contracted Pelvis, ... 465
II. Dwarf Pelvis, ... 465
(b) Narrow Pelvis with Change of Form, ... 466
III. Simple Flat Pelvis, ... 466
IV. Obliquely Distorted Pelvis, ... 468
V. Transversely Contracted Pelvis, ... 471
VI. The Irregularly-compressed Pelvis, ... 472
VII. The Spondyl-olisthetic Pelvis, ... 473
VIII. The Funnel-shaped and Lumbo-sacral Kyphotic Pelvis, ... 475
IX. Narrowing of the Pelvis from Exostoses, Tumors and Fractures, . 476
X. The Fissured Pelvis, ... 477

CHAPTER II.

PAGE
Disturbances of Labor Due to Faulty Labor Pains, ... 503
  1. Weak Labor Pains, ... 503
  2. Too Strong Pains, ... 515
  3. Spasmodic Pains, ... 521

CHAPTER III.

Disturbances of Labor Due to a Faulty Development of the Uterus and the Vagina, . 526

CHAPTER IV.

Disturbances of Labor Due to Muscular Neoplasms of the Uterus, ... 533

CHAPTER V.

Disturbances of Labor Resulting from Carcinomatous Degeneration of the Uterus, . . 542

CHAPTER VI.

Disturbances of Labor Due to Atresia and Adhesion, Stenosis, Rigidity and Swelling of the Cervix, the Vagina and Vulva, ... 547
  1. Atresia and Adhesion of the External Os Uteri—Conglutinatio et Atresia Orificii Uteri Externi, ... 547
  2. Stenoses, Abnormal Rigidity and Swelling of the Soft Parts, as Causes of Disturbances of Labor—Stenoses, Rigiditates et Intumescentiæ Genitalium, . . 549
  3. Neoplasms of the Vagina as Obstacles of Labor, ... 551
    (1) Connective-tissue and Muscular Tumors, ... 551
    (2) Cysts of the Vagina, ... 552
    (3) Hydatid Cysts in the Pelvic Connective Tissue, ... 552
  4. Other Disturbances of Labor Dependent upon the Soft Parts in the Small Pelvis, ... 553
    (1) Retro-uterine Hæmatocele, ... 553
    (2) Cystocele Vaginalis and Vesical Calculi, ... 554
    (3) Vaginal Enterocele, ... 555
    (4) Hæmatomata, ... 556

CHAPTER VII.

Disturbances of Labor Due to Lacerations of the Uterus, ... 556

CHAPTER VIII.

Disturbances of Labor Due to Delayed Expulsion of the Afterbirth—Abnormal Adhesion of the Placenta to the Wall of the Uterus, and Hemorrhage during the Third Stage, ... 570

SECTION III.

DISTURBANCES OF LABOR DUE TO A FAULTY CONDITION OF THE NON-SEXUAL ORGANS, ... 578

CHAPTER I.

Dystocia Due to a Faulty State of the Abdominal Organs, ... 578
  (1) On the Part of the Intestines, ... 578
  (2) On the Part of the Kidneys, ... 580

PAGE
(3) Rupture of the Spleen, ... 580
(4) Tumors of the Liver, ... 580
(5) Rupture of the Aorta, ... 581
(6) Excessive Vomiting, ... 581

CHAPTER II.

The Diseases of the Circulatory Organs, ... 581

CHAPTER III.

Dystocia due to the Brain and Spinal Cord, ... 582
Deliveries complicated with Chronic Affections of the Spinal Cord, ... 583

SECTION IV.

GENERAL DISEASES AND DEATH OF THE PARTURIENT, ... 584

CHAPTER I.

Fever, ... 584

CHAPTER II.

Disturbances of Labor due to Convulsions and Coma: Eclampsia 586

CHAPTER III.

Sudden Death of the Parturient, ... 597

CHAPTER IV.

Delivery after the Death of the Mother, ... 599

PART VI.

OBSTETRIC OPERATIONS.

CHAPTER I.

[illegible] Division—Frequence of the Operations in Hospital and Private Practice—[illegible] on the Manikin, ... 601

CHAPTER II.

[illegible] Requirements for the Performance of Obstetric Operations, ... 604

CHAPTER III.

[illegible] 605

CHAPTER IV.

[illegible] Anæsthesia of the Parturient, ... 610

CHAPTER V.

[illegible] Armamentarium and the most necessary Medicaments in Deliveries [illegible] Interference, ... 611

CHAPTER VI.

PAGE
Commencement and Completion of the Operation—General Advice, ... 612

SECTION I.

PREPARATORY OPERATIONS—THE ARTIFICIAL INDUCTION OF LABOR.

CHAPTER I.

The Induction of Abortion, ... 614

CHAPTER II.

The Induction of Premature Labor, ... 619

SECTION II.

OPERATIONS FOR OVERCOMING OBSTACLES TO LABOR.

CHAPTER I.

Incision of the Introitus Vaginæ—Episiotomy, ... 632

CHAPTER II.

The Artificial Dilatation of the Os Uteri, ... 634

CHAPTER III.

Version by External Manipulations, ... 637

CHAPTER IV.

Combined Indirect Version—The Methods of Hohl and Braxton Hicks, ... 639

CHAPTER V.

Combined Direct Version by the Introduction of the Whole Hand, ... 641
  (A) Internal Cephalic Version, ... 641
  (B) Combined Direct Version on the Pelvic Extremity, that is on one or both Feet, ... 643

CHAPTER VI.

External and Internal Manipulations for the Conversion of a Brow or Face Presentation into a Vertex, ... 655

CHAPTER VII.

Reduction in Size of the Child by Obstetric Operations—Perforation, ... 657

CHAPTER VIII.

The Comminution of the Bones of the Fœtal Skull—Cephalotripsy—Basiotripsy—Basilysis, ... 663

CHAPTER IX.

The Separation of the Fœtal Head from the Body—Decapitation, ... 668

CHAPTER X.

PAGE
The Removal of the Thoracic and Abdominal Viscera of the Child—Evisceration, . . 669

CHAPTER XI.

Reposition of Prolapsed Extremities, ... 670

CHAPTER XII.

The Reposition of the Prolapsed Cord—Omphaloproptosis, Apothesis Funiculi Umbilicalis, ... 672

SECTION III.

OPERATIONS PERFORMED DURING DELIVERY.

CHAPTER I.

Expression of the Child—Expressio Fœtus, ... 677

CHAPTER II.

Expression of the Head and Extraction by Means of the Shoulders after the Birth of the Head, ... 679

CHAPTER III.

Extraction of the Child by its Pelvic Extremity, ... 681

CHAPTER IV.

The Forceps Operations, ... 692

CHAPTER V.

The Extraction of the Head, Reduced in Size, after Perforation, Decapitation and Eventration, with the Cranioclast, Cranial Forceps and Hook, ... 712

CHAPTER VI.

Abdominal Incision—Laparotomy, ... 717

CHAPTER VII.

The Abdomino-uterine Incision, Laparo-hysterotomy, Sectio Cæsarea, ... 722

CHAPTER VIII.

The Porro Operation—Laparotomia cum Hysterectomia Partiali, ... 727

CHAPTER IX.

The Artificial Removal of the Placenta, the Membranes, and Fragments of Placenta Left Behind in Utero, ... 731

CHAPTER X.

Forcible Delivery—Accouchement Forcé, ... 735

PART VII.

THE PATHOLOGY AND THERAPEUTICS OF THE PUERPERAL STATE.

CHAPTER I.

PAGE
Wounds of the Genitalia of Puerperal Women, ... 737
  1. Lacerations of the Perineum, ... 737
  2. Other Lacerations of the External Genitals and of the Ostium Vaginæ, . . . 743
  3. Lesions of the Vagina without any Communication with the Neighboring Organs, ... 744
  4. Lacerations of the Vault of the Vagina and of the Uterus, ... 747

CHAPTER II.

Displacements of the Puerperal Uterus—Depression and Inversion of the Uterus in Puerperio, Depressio et Inversio Uteri Puerperalis, ... 751

CHAPTER III.

Hemorrhages from the Genitals in the Puerperium, ... 759
  (A) External Hemorrhages, ... 759
  (B) Internal Hemorrhages:—
    1. Effusion of Blood into the Tissue of the Vulva and Vagina (Thrombus s. Hæmatoma Vulvæ et Vaginæ), ... 771
    2. Internal Uterine Hemorrhage, Decidual and Placental Polypi, and Hemorrhage into the Parenchyma of the Uterus (Metrorrhagia Interna—Hæmatoma Uteri), ... 777

CHAPTER IV.

Puerperal Inflammations of the Genitals, ... 781
  1. Inflammations and Ulcers of the External Genitals and the Vagina, ... 781
  2. Simple Inflammation of the Vagina and Endometrium (Colpitis et Endometritis Puerperalis Simplex), ... 784
  3. Inflammation of the Uterus, of the Subperitoneal and Pelvic Cellular Tissue—Pelvic Exudations (Metritis, Parametritis, Phlegmone Pelvis), ... 787
  4. Disease of the Uterus Associated with that of the Lymphatics and the Peritoneum (Metrolymphangitis et Peritonitis). The so-called Septic Form of Puerperal Fever, ... 794
  5. Puerperal Venous Thrombosis and Metastatic Pyæmia, the Venous Form of Puerperal Fever, ... 811
  6. Puerperal Diseases of the Thighs—Phlegmasia Alba Dolens and Phlegmone Cruralis in Puerperio, ... 825
  7. External and Internal Puerperal Erysipelas, ... 832
  8. The Etiology of Puerperal Fever—*i. e.*, the Puerperal Mycosis, ... 840

SECTION II.

PUERPERAL DISEASES OF THE FEMALE BREASTS.

CHAPTER I.

Diseases of the Nipples, ... 854

CHAPTER II. PAGE

Diseases of the Integument of the Mamma and the Perimammary Connective Tissue—Perimastitis, ... 857

CHAPTER III.

Inflammation of the Parenchyma of the Breast—Mastitis Parenchymatosa seu Lobularis, 858

CHAPTER IV.

Anomalies in the Secretion of Milk, ... 861

SECTION III.

PUERPERAL DISEASES OF THE NON-SEXUAL ORGANS.

CHAPTER I.

Diseases of the Urethra and Bladder—Inflammation of Ureter and Renal Pelvis, . . . 865

CHAPTER II.

Affections of the Pelvic Articulations, ... 868

CHAPTER III.

Neuralgias and Paralyses of the Lower Limbs, ... 871

Puerperal Tetanus, ... 873

CHAPTER IV.

Mental Diseases in Puerperal Women, ... 874

CHAPTER V.

Skin Diseases of Puerperal Women, ... 878

CHAPTER VI.

Sudden Death in Puerperal Women, ... 879

PART VIII.

PATHOLOGY AND THERAPEUTICS OF DISEASES OF THE NEWBORN.

CHAPTER I.

Asphyxia of the Newborn—Asphyxia Neonatorum, ... 883

CHAPTER II.

Cephalhæmatoma, ... 887

CHAPTER III.

Inflammation of the Eyes in the Newborn—Ophthalmo-blennorrhœa Neonatorum, . . 888

CHAPTER IV.

PAGE
Fungi of the Newborn—Sprue—Aphthophyta, ... 890

CHAPTER V.

Inflammation of the Breast—Mastitis Neonatorum, ... 892

CHAPTER VI.

Umbilical Diseases of the Newborn, ... 893

CHAPTER VII.

Jaundice—Icterus Neonatorum, ... 896

CHAPTER VIII.

Lockjaw—Trismus and Tetanus Neonatorum, ... 897

CHAPTER IX.

Acute Fatty Degeneration of the Newborn—Buhl's Disease, ... 898

CHAPTER X.

Acute Hæmoglobinuria of the Newborn—Winckel's Disease, ... 898

CHAPTER XI.

Hardening of the Cellular Tissue—Sclerema Neonatorum, ... 899

CHAPTER XII.

The Black Disease—Melæna Neonatorum, ... 900
Index, ... 903

TEXT-BOOK

OF

MIDWIFERY.

HISTORICAL INTRODUCTION.

When we undertake to investigate the early history of midwifery, the query naturally suggests itself, by what means the first man in the world attempted to alleviate the sufferings of the first child-bearing woman, his wife, and the answer as naturally suggests itself: he without doubt put her in the most comfortable position, or provided her with a good bed. If they were already housed in a tent or hut, no doubt a layer of straw or a bed of the fur of animals was furnished; or, if they were on the march, a sheltered spot or cave was sought for and a comfortable seat provided, the husband in all probability seating his wife upon his lap in order to comfort and console her. Moreover, in answer to his wife's entreaties, he doubtless supported the region of the sacrum in order to overcome the severe pains felt there during the first stage of labor, and also held her hands as soon as the bearing-down pains began, in order to give her something to pull against and thus alleviate the pains. Finally, the delivery of the head having been safely accomplished, he observed the child during its exit, caught it and put it down in a comfortable position; the after-birth then made its appearance after a certain time, and upon seeing it, it at once became evident to him that the cord must be cut in order to free the child from this appendage. Whether he tore the cord with his hands, or cut it with a sharp stone or rush, is of little consequence; but it is certain that he pressed or tied the end of the cord attached to the child, when he found that it continued to bleed. It is also likely that he then cleaned off the sebaceous matter covering the surface of the child; still it is possible that the division of the cord as well as the child's toilet were attended to by the happy mother herself, as is the custom even to-day among the Indians and savage races of the Dark Continent.

It must have been an anxious time for this inexperienced obstetrician, as the pains, cries and bearing-down became worse and worse, and no doubt with the increasing desire for help many a fervent prayer was sent to heaven by him, and perhaps, between the pains they joined together in prayer, ceremonies and vows, such as seemed calculated, in their minds, to predispose the aiding God in their favor.

At the period of the second birth, after about a year and a quarter, the joyful spouse observed his better half with a certain amount of experience, preparing the bed and arranging for the reception of the child, and certainly not neglecting to call down the blessing of God. This time the birth ran its course satisfactorily, and without doubt more quickly than the first time; indeed, remarkably soon after the commencement of the bearing-down pains it terminated. Suddenly, however, after the birth, the young mother grew weak, and the apprehensive father, seeing that his wife was losing blood, rapidly severing the cord and putting the child to one side, tried to check the hemorrhage by pressing upon the abdomen from above and the external parts from below, when he noticed the delivery of the after-birth and cessation of the hemorrhage, he having thus performed the first non-spontaneous expression of the placenta.

It is probable, as the race increased, that the strength of the first and only obstetrician was not equal to the task, or perhaps he became tired of offering his lap to every applicant; and this led to the invention of the first labor chair, similar to the one built in our own century by a Thuringian cabinet maker.

As the number of men increased, the women became more modest, and this as well as the excessive demand for the services of the original practitioner led necessarily to the introduction of midwives and to courses of lectures, necessarily still very primitive, for their instruction. These women, at first probably only friends of the woman in labor, helped as long as they could, and by modifying the couch or chair, pressing the back and abdomen, the administration of herbs and drinks, by amulets, vows and prayers, tried to facilitate the birth; but sometimes they also lost heart, and the conviction gaining ground that the more determined and stronger man was the only one who could help them out, he was sent for immediately. The obstetrician having hurriedly arrived, first tried those measures previously known to him, but without success. He knew that a child was there and in what way it should come into the world, but he saw nothing of it; finally he decided for the first time to feel and try to discover some trace of it, and behold, he found a foot. Called upon for help as he was, what was more natural for him than to pull upon this foot slowly, and gradually draw forth the child? The trunk followed smoothly; one arm glided out, but the other was extended above the head; he grasped the body, pulled and pulled, and finally succeeded, with the greatest difficulty, in extracting the dead child. This was the first extraction of a pelvic presentation, and the obstetrician thenceforth knew how difficult it is to perform, and how unfavorable it is for both mother and child. Another fright followed the finding of the foot: extensive hemorrhage set in and the exhausted uterus refused to contract. Pressure above and below was tried but did not still the bleeding, and the placenta was not born—prayers, vows and amulets were all without avail. Finally, after trying the upright position, shaking the half-delivered woman, and tightly bandaging her abdomen, in short when all means had failed, nothing remained but to follow the cord into the parts until he felt the placenta and to strip it off with his hand from the site where it was solidly implanted, thus performing the first artificial separation of the after-birth, and saving the poor woman's life.

Upon another occasion he was sent for because the strength of the woman was exhausted and he felt the child's head in the lower part of the canal. He said to himself, I must grasp this, just as I did the foot; this he tried to do with two and with four fingers, but they slipped off; then he tried it with two fingers of each hand, but did not succeed; he was convinced that the grasping of the head with both hands would make it possible to deliver it; yet he paused at this obstacle, knowing that there was no room for his hands between the head and the parts, and it was not until centuries later that this difficulty was surmounted, and the hands were metamorphosed into the narrow, long blades of the forceps. Hippocrates' words show that this conception is no idle fancy, and was thought of thousands of years ago: "Quod si extra uteri osculum, verum intra pudenda fuerit caput infantis, reliquum corpus extra pudenda 'manibus immissis caput apprehensum extrahito.'" Our obstetrical friend, however, was not able to extract with the hands and could only grasp a small portion of the head. The idea finally struck him to make the head smaller, and he performed the first embryotomy or perforation with a sharp stick or thin cutting stone. However, the birth was not yet ended and he was soon obliged to pass a blunt hook of hard wood into the head, and with this the first extraction with the blunt hook was done, and was doubtless soon followed by extraction with instruments resembling the bone forceps. Having thus become convinced that this kind of delivery was not particularly difficult, nor very inconvenient to the woman, it was often used in difficult cases by obstetricians.

The foot presentation was regarded as unfavorable to the woman, and accordingly the hand was introduced and the head brought down instead of the presenting part, and direct internal cephalic version was thus performed for the first time.

It is reasonable to suppose that difficult births were managed as depicted in the foregoing, even in the days of antiquity, and we do not go too far in supposing that among so cultivated a people as the Greeks, at the time of Hippocrates, midwifery had been pretty well developed for hundreds of years. The same may be said of the Romans, for it is absolutely inconceivable that the necessity of the lex regia would have been demonstrated in the time of Numa Pompilius (715 B.C.), unless midwifery had already attained a high degree of development, and numerous cases of extraction of a living child from the dead mother had been observed. The first professional services, which were probably of a surgical nature, must have gone hand in hand with obstetrical work; the latter may even have preceded the former. This is supported by the early mention of obstetrical goddesses, such as Bubastis, the goddess of the Egyptian child-bearing women, whose head resembled that of a cat.

Midwives existed among the ancient Egyptians, whose women were said to be more difficult to deliver than the Jewesses. Furthermore, they had rules for the facilitation of conception, the recognition of fruitfulness and the existence of pregnancy. If a woman partook of a drink prepared from the Boudoduca weed and the milk of a woman who had borne a son, and thereupon vomited, she was held to be pregnant; if, however, she simply belched, the contrary was the case. Roast placenta was one of the remedies used by the Egyptians. The Jews while in Egypt also had wise women, who, however, consoled more than they helped. The Levites determined sexual maturity, and even had civil medical rules as to sexual intercourse, marriage between relations, etc. The labor chair was used for delivery, and it was known that the Jewish women bore frequently and easily. Red and white lochial discharges were distinguished, the former lasting for seven days after the birth of a boy, and for fourteen days when a girl was born, while the latter flowed for thirty-three or sixty-six days respectively. In India ordinary help at birth was given by female friends, but in difficult cases male aid was called in. The goddess Istar of the Assyrians and Babylonians presided over fecundity and generation. Obstetrics among the Chinese and Japanese was in the hands of midwives, who studied the presentation from pictures in books, and made use of amulets and superstitious manipulations, and also of special obstetrical stockings. The god of fruitfulness among the Japanese was Fottei. The ancient Germans had healing witches and, moreover, idols who removed barrenness and facilitated delivery. Fricco was called upon to bestow fruitfulness, while Hela helped the woman in labor. This latter goddess was called Laima by the Borussians. The Grecian deities were Hera (Juno) and her daughter Ilithyia, and Artemis. Healing women mentioned by Homer were: Helena, and Agamede the Fair who knew the healing herbs. Lato, who was pregnant by Jupiter, fled from the jealous Juno at the time of her confinement, and found a safe refuge on the island of Delos. She was nine days and nights in labor, and supporting herself by a palm tree, gave birth to Apollo, the god of music and medicine, and twenty-four hours later his twin sister Artemis was born. The Romans had goddesses presiding over menstruation and the uterus, Fluonia and Uterina, also obstetrical deities: Carna, Dea Natio, Deæ Carmentæ, and furthermore Prosa and Postverta, for malpositions of the child. In 715 B.C., Numa Pompilius promulgated the law which directed that the children should be cut out from the bodies of deceased pregnant women. Soranos of Ephesus (in the time of Trajan and Hadrian 100 A.D.) wrote what was claimed to be the first (?) book for the instruction of midwives.

This book proves that ordinary and operative gynæcology and obstetrics, as well as the treatment of the child, were even then the most highly developed branches of ancient medicine. Among the Romans there were old women, mostly prostitutes and wise women, who treated diseases of women, gave love potions and drinks to cause abortion and premature delivery, and also served as procuresses. Among the Arabs, it was almost impossible for a man to practice obstetrics and gynæcology. Their text-books were those of Hippocrates, Galen, Oribasius, Dioscorides, Aëtius and Paulus. After the first half of the middle ages, the monks monopolized the practice of medicine among the higher classes almost entirely, with the exception of surgery for stone and hernia. Salerno, or rather the school of that name, was the forerunner of the later university, but more was done in this direction by the school of Montpellier, where regular post-mortem examinations were held from 1376 on, and which were performed as early as 1153.

In the time of Charles the Great, there existed houses for young pregnant girls, who were attended almost entirely by women.

As regards the knowledge possessed of pregnancy in olden times, according to the Talmud, its duration is from 270 to 273 days, and it cannot be recognized before the fourth month; one of the signs was, sinking in deeper when walking upon soft ground. An eight-months' child was said to be not viable. The child, it states, lies folded up like a scroll, with its hands upon its temples, floating in the amnion like a nut in water.

In India it was believed that after impregnation the embryo fastened itself in the first month; in the second month it became egg or bullet-shaped, with indications of head and extremities at the third month. At the fifth month the form of head and trunk was visible, growing more distinct at the sixth and seventh months. The child became uneasy at the eighth month and was born from the ninth to the twelfth month. The head of the child was above at first, with its mouth toward the spinal column, praying to God, thereby seeing heaven, the earth and the lower regions, but just before birth, turned in such a manner as to present with its head below.

Herophilus of Chalcedon was familiar with the cervical changes in the pregnant woman. Moschion (about 220 A.D.) believed that, during pregnancy, the menstrual blood was used for the nutrition of the child.

Galen mentioned that the secretion of milk was due to the pressure of the uterus upon the vessels of the abdomen. The Arabs predicted pregnancy and the future birth of a son by examination of the urine, while Rhazes claimed to be able to foretell the number of the future children of a primipara, by the number of wrinkles on her belly. Garib ben Said gave a method for recognizing the sex of the child in the uterus, etc.

Evisceration, Cæsarean section, and version were known among the followers of the Talmud. In India the Cæsarean section was used in dead pregnant women, also podalic version, extraction, embryotomy and craniotomy; the latter was only used upon a dead child. Foot, breech, back, side and breast presentations, together with prolapses of the arm, were regarded as malpresentations, which were to be changed or terminated by artificial means. The Japanese practiced a sort of external version after the method of the celebrated obstetrician Kagawa-gen-ets. The Aztecs (Mexico) tried to correct or prevent malpositions by kneading the abdomen from the seventh month on, and if this did not suffice, the mother was grasped by the legs and shaken until the head was in the proper position for presentation. Æsculapius, the son of Apollo and Coronis, is said to have been delivered by Cæsarean section.

In the time of Hippocrates (430 B.C.) the entire domain of obstetrics was in the hands of midwives (omphalotomoi), with the exception of cases in which the child was dead, when the operations were performed solely by men. The more scientific midwives: *Μαῖαι*, *Ιατρομαῖαι*, *Ανεστρεῖς*, in addition to the ordinary aids, such as kneading and massage of the abdomen to correct the presentation and the administration of medicines, also led the holy songs at the time of birth, effected abortion, had private asylums for lying-in women, and treated diseases of women. Hippocrates' mother was a midwife.

At the time of Aristotle (350 B.C.) females were forbidden to practice obstetrics in Athens. Agnodice, however, disguised as a man, succeeded in evading this law and brought about its repeal in Athens (285 B.C.).

The followers of Hippocrates understood the adherence and separation of the afterbirth and tried cephalic version in pelvic presentations. Hippocrates is said to have advised a songstress to produce abortion by jumping with the heels against the buttocks. Perforation, hook extraction and amputation of the arm were all in vogue.

Soranos taught that artificial abortion was less fraught with danger at the third month, but was dangerous on account of the liability to tetanus; that inversion of the uterus was liable to follow incautious removal of the adherent placenta. He knew the knee-elbow position, and that premature rupture of the membranes meant a difficult birth. If the child was alive, he practiced cephalic and podalic version in appropriate cases. Celsus (25 B.C. to 50 A.D.) described extraction with the hook, decapitation and expression ot the fœtus, podalic and cephalic version in cases of cross birth and dead child.

Aëtius, of Amida (502–575 A.D.) advised amputation of the upper and lower extremities, if necessary, in malpositions, as well as decapitation, and the sharp hook for extraction of the head and trunk.

Ali Ben Abbas (†994 A.D.): Dismembering with extraction was allowed to be performed by midwives only.

According to the Gothic laws the performance of artificial abortion was punished by putting out the eyes. The Romans, on the contrary, tolerated abortion. Cæsarean section was probably performed upon the dead woman in the second half of the middle ages, by those who made a specialty of cutting for stone and hernia. It is pretended that a bishop of Constance and an abbot of St. Gallen were saved by this means.

Among the gynæcologists of the first half of the middle ages, in addition to Aëtius, of Amida, in Mesopotamia (502–575), may be named Paulus, of Ægina (625–690), the Arab Rhazes (Abu Bekr es Razi [850–932]), Ali ben Abbas (†994), Garib ben Said (830–930), Avicenna (980–1037), and Avenzoar (1113–1162).

In 542 the first hospital was founded in Lyons, followed by another in Merida in 580. In the second half of the middle ages are mentioned: "Trotula s. Eros," the work of a doctor of Salerno on diseases of women, and the writings of Albertus Magnus (Thomas von Brabant) on reproduction and birth, 1250.

The fifteenth century was remarkable because of the establishment of many universities: Prague, Rostock, Leipzig and Greifswald. Among the Italians the gynæcologists were especially prominent, as Petrus Bairut, Turin, 1500; Gabriel de Zerbis, Padua, 1490; Petrus ab Argelata (14th century), the first obstetrician of Bologna; Nicolas Bertrucci, artificial rupture of the membranes; Benevieni, Florence, †1502, podalic version; Lanfranchi, Milan and Paris, 1295, dilatation of the internal os uteri. The most prominent obstetricians of the subsequent centuries are given below, tabulated according to their respective countries:—

THE SIXTEENTH CENTURY.

Reintroduction of version: Paré; first Cæsarean section on the living. Foundation of Wittenberg University (1502), Universities of Frankfort (1506) on the Oder and Marburg.

Michael Servetus has ideas about a pulmonic circulation. Paracelsus delivers his lectures in German, and writes in German.

The first German book for midwives by von Rösslin (*see below*). Obstetrics and surgery become independent sciences.

Clinical instruction is introduced at Padua at the instigation of German students. Bottoni treated the males and Marco degli Oddi the females. Post-mortem examinations were also made, but were prohibited later on, 1578, owing to the removal of the uterus in one of the cases.

In 1580 the shepherds and goatherds were forbidden to deliver women in Wurtemberg.

In 1573 the first regulations for midwives were issued by Lonicerus, at Frankfort-on-the-Main.

German.	French.	Italian.
Paracelsus (1493–1541). The physician is in truth an itinerant; propter uterum est mulier. Nufer, Jacob. Pig castrator. Sect. cæsarea on his own wife (1500). Cæsarean section in Neusse, 1531. Paul Dirlewang. Vienna. The same. Rösslin, E. († 1526, Worms.) Face presentations. Rueff, Jacob. († 1554.) Cephalic version. Schenck v. Grafenberg. First observation of hydatiform mole.	Paré, Ambr. (1517–90). Podalic version. Bourgeois, Louise. (1564.) Good prognosis in foot cases. Rousset, Fr. (1580.) 15 successful Cæsarean sections. Franco, Pierre. Instrument resembling vaginal speculum as forceps for the head. (1576.) Three-bladed speculum—Accouch. forcé—Detachment of the placenta.	Berengar. († 1550.) Extirpated the prolapsed uterus. Bonaciolus, Ferrara. (1540.) Colombo, M. R. († 1559.) A frequent operator and combated spontaneous version at the seventh month. Faloppia, Gabr. (1523–62.) Modena. Prof. at Ferrara. Hymen, clitoris, ovaries and tubes. Fabricius ab Aquapendente. (1573–1619 in Ferrara.) Embryology. Aranzi, J. C. († 1589, Bologna.) Ductus venosus. Foramen ovale.

THE SEVENTEENTH CENTURY.

Germany's disastrous thirty years' war. Obstetrics passes more and more into the hands of educated physicians.

Invention of the forceps. Discovery of the circulation, 1616. Microscope invented, 1620 (Drebble and Jansen). Sanctorius (—1635) in Padua, thermometer; the balance; physiology. Malpighi, 1661, blood corpuscles.

German.	French.	English.	Italian.	Dutch.
Fabricius Hildanus (1560–1634). Wife a clever midwife. Justine Siegemundin (1690). Artificial premature labor. Rupture of the membranes in twin labor. Amnion. Bimanual manipulation. Trautmann, Jerem., Wittenberg. Sectio Cæs. in hernia and pregnancy. Mother died in 25 days. Living child. 1610. Hoppe, Joh. (1652). Welsch (1655), Lange. Miliaria of the puerperal woman.	Denys, J. B. († 1704). Physician to Louis XIV. 1666 the first transfusion with lamb's blood. Mauriceau, Franc., (Paris, † 1719). Version. P. prævia and treatment. Tire-tête. Against sectio cæs. Clement, Jules (1649–1729). 1633 Accoucheur. De la Motte (1655–1737). Version in narrow pelvis. Peu, Phil. (Paris, † 1707). Face present. without artificial aid. Portal, Paul († 1703). Version, 1 foot. Amand, Pierre (Paris, † 1720). Instrument for the extraction of the torn-off head. Andry, Nicolas (Lyons, 1658–1742). Spermatozoa in the ovum.	Glisson, Francis. First description of rachitis. Lower and Boyle. Transfusion of animals. King, Edm. (1665). From vein to vein successfully. Needham, W. (London, † 1691). Fœtus nourished by placental blood, plac. fœtal, and maternal. Umbil. vesicle. Gravid uterus. Willis, Thomas (Oxford, 1622–75). Puerperal fever as such, peculiarly defined.	Sanctorius, S. (1635). Punctio abdom. Speculum. Severino, M. A. Benign tumors of the breast (1580–1656). Fracasatti, C. Transfusion performed. In Italy male obstetricians prevailed as early as the beginning of the 17th century. **Swedish.** Van Hoorn, I. (1661–1724). Stockholm. Pupil of Gregory V.	Van Solingen, Cornelius (Haag, † 1692). Improvement of the instruments in use. Falfyn, Joh. (1649–1730). Forceps. Von Deventer, H. (1651–1724). Normal gravid state. Operative obstetrics. Pelvic axis. Version. Diagonal diameter. Regner de Graaf, Delft (1641–1673). Ovaries—the egg layers, follicle. Aura. Drelincourt (Leyden, 1633–97). Impregnation in the uterus. Swammerdam (1637–80). In Holland the male obstetricians were appointed by the State. The midwives were called "lappers" (Schoossers).

Helmstädt: Statutes for the professors:—

We will protect and cherish the healing art, as firmly established and handed down to us by the divinely inspired scientists, Hippocrates, Galen, and Avicenna, and endeavor to promulgate it by our teachings.

Practical teaching was tried in Utrecht and Leyden, 1638, but abandoned again in 1648, as being inconvenient for the students. Theory and prescriptions again taken up. In 1658 the clinical system was definitely established by Sylvius in Leyden.

Practical instruction in obstetrics up to the seventeenth century had not as yet been given to male students, and men were not admitted to the Hôtel Dieu. Instruction given to midwives in Paris, Stockholm, and Brandenberg. Laws governing midwives, 1685.

THE EIGHTEENTH CENTURY.

GERMAN.	DANISH.	FRENCH.	ENGLISH.
Stoll, Max. (1742–1787.) Vienna (Schwabe). Milk fever and mucus fever.	Saxtorph, Math. (1740–1800.) Normal cephalic birth. Forceps.	Bordeu, Théophile. (1722–1776.) Montpellier and Paris. Milk fever. The doctrine of the pulse. Recognition of the menses by it.	Smellie, Wm. (London, 1680–1763.) Head presentation. Cephalic and podalic version. Hook forceps. Perforation. Phantom.
Hoffmann, Fred. Hysteria, chlorosis, thermometer.	Bang, Janus. (1774.) Angle of inclination of the pelvis.	De la Peyronie, F. G. (1678–1747.) Founder of the first professional chair. Lectures on obstetrics.	Hunter, Wm. (London, 1718–1783.) Decidua. An enemy of instruments. Anatomy of the gravid uterus.
Büchner, Peter. Bone softening in rachitis.	**RUSSIAN.**	De Puzos, N. (Paris 1686–1753.) First protection of perineum. Bimanual exploration. Podalic version. Friction of os uteri to hasten labor.	Denman, Thomas. (1733–1815.) Theory of normal labor. Recommends induction of premature labor. Puerperal fever communicated by doctors and midwives. Spontaneous version in prolapse of the arms.
Sprengel, Kurt. (1766–1833.) 1789, Prof. at Halle. 1792, History of Medicine.	v. Mohrenheim, died 1799.	Mesnard, Jacques, Rouen. Cranial forceps.	Aitken, John. († 1790.) Excision of a piece of the bony pelvis instead of sectio cæs.
Von Siebold, C. C. (1736–1807). Würzburg. First symphysiotomy in Germany.	**DUTCH.**	Levret, André. (1703–1780), Paris. Forceps. Perforation. Detachment of the margin in plac. prævia.	Johnson, R. W. Forceps with pelvic and perineal curvature.
Fried, J. J. (1689–1779.)	Camper, Peter. Pelvic axis. Proposition of symphysiotomy.	Petit, Antoine and Péan. An excellent teacher of obstetrics.	Leake, John. († 1792.) Forceps. Wrapping the legs with cold wet cloths in metrorrhagia. Auto-transfusion.
Fried, G. H., the son, Strassburg.		Deleurye, F. A. Version in unruptured membranes, separate extraction.	**ITALIAN.**
Heister gave the first lectures on obstetrics in Helmstädt.		Sigault, J. R. (Paris, 1777). Symphysiotomy.	Vespa, Gius.
Roederer, J. G. (1726–1765.) Strassburg and Göttingen.		Lauverjat. († 1800.) Method of sectio cæs.	Ferrara, Dom.
Stark, Joh. Chr., the elder. (1753–1811.) Jena. Placental curette.		Solayres de Renhac, Fr. L. J. Mechanism in head presentation.	Assaline. "Tire-tête" and a sort of cephalotribe with trepan perforation.
Stein, G. W., the elder. (1737–1803.) Died at Cassel. A pupil of Levret. Pelvimeter, version, forceps. 1728, Strassburg. 1751, Göttingen.		Baudelocque, J. L (1746–1810.) Pelvic measurement. Against sectio cæs. Symphysiotomy and the induction of premature labor.	Monteggia. Translation of Stein into Italian.
Achenwall, G. (1719–1772.) The founder of the scientific statistics.			
Zeller, Simon. Vienna. Natural labor in face presentation.			

The first medico-chemical examinations of milk, chyle, and bile by de Foucroy (1755–1809). Many new plants described. Fever theories of

Cullen. Natural healing tendency. Animal magnetism: Mesmer. Phlogistic and antiphlogistic theories. Brown's sthenic and asthenic diseases. Pinel's Realism. Bichat: Pathological anatomy. Auenbrugger: Percussion. Endemic puerperal fever in the large maternity hospitals of Paris, London, Copenhagen, Dublin, Edinburgh and Berlin, and in 1784, also, at Gladenbach, near Giessen. Anatomy, surgery and obstetrics are still regarded as one department, lectures upon them being usually delivered by the Professor of Surgery (*see "Medical Regulations of Prussia,"* 1786). 1720, The first obstetrical clinic is founded by Gregoire, Sr., at the Hôtel Dieu. 1745, Ambulatory clinic in Prague. 1754, First clinic by van Swieten in Vienna. Roederer, the first German Professor of Obstetrics. Gehler, of Leipzig, Aepli, of Diedenhofen-on-the-Rhine, Ehrhardt and Appun made valuable observations on the natural birth of the secundines. A. v. Haller vivisected extensively, and demonstrated the uterus to be composed of muscular fibres; described also the corpora lutea and decidua vera. Journal devoted to obstetrics.

THE NINETEENTH CENTURY.

German.

Boër, L. J. (1751-1835), Vienna.
Osiander, F. B. (1759-1822).
Schmitt, W. J. (1760-1827), Vienna.
Wigand, J. H. (1769-1817).
Stark, Joh. Chr. (1769-1837), Jena.
Naegele, Fr. Carl (1777-1851). Pelvis. Mechanism.
Mai, F. A. and K. Wenzel (1804). Premature labor.
Stein, G. W. (1731-1803), Cassel.
v. Siebold, A. E. (1775-1828), Berlin.
v. Siebold, E. C. J. (1801-1861), Göttingen.
Busch, D. W. H. (1788-1858), Berlin.
Doutrepont, J. (1775-1845), Würzburg.
Ritgen, F. (1787-1866), Giessen.
Hohl, A. F. (1789-1862), Halle.
Jungmann, A. J. (1775-1854), Prag.
Carus, K. G. (1779-1868), Dresden.
Mende, L. J. (1779-1832), Göttingen.
Kilian, H. F. (1800-1863), Bonn.
Kiwisch, Frz. (1814-1852), Würzburg.

German.

Michaelis, G. A. (1798-1848), Kiel.
Martin, E. (1809-1875), Berlin.
V. Hecker (1827-1882), Munich.
Spiegelberg (1830-1881), Breslau.
Schroeder, (1838-1887), Berlin.

French.

Mayor (1818). Heart sounds heard
Lejumeau de Kergaradec, J. A. (1821). Auscultation of pregnant women.
Rècamier (1818). Speculum.
de Lamballe, Jobert (1799-1867). Fistulæ.
Velpeau, A. (1795-1868). Obstetrics. Monograph on the breasts.
Baudelocque, A. (1829). Cephalotripsy.
Lachapelle, M. L. (1769-1821). 40,000 births.
Boivin, M. A. (1774-1841).
Dubois, Ant. (1756-1837).
Dubois, Paul (1795-1858).
Depaul, J (1811-1883).
Stoltz, Jos. A. Induced premature labor.

English.

Merriman, S. (1732-1819).
Burns, John. Glasgow (1775-1850).
Collins, Robt. (1801-1868). 16.654 births.
Ramsbotham, F. J. (1800-1868). Premature labor by ergot.
Simpson, J. Y. (1811-1870). Chloroform. Acupressure.

American.

Jackson (1841-42) and Morton (1846). Ether.
Dewees, W. P. (1767-1841).
Meigs, Ch. D. (1815-1869).
Channing, W.
Sims, Marion (1813-1883).

Italian.

Galbiati (1776-1844).
Trinchinetti.
Lazzati (1814-1871).
Longhi.

Dutch.

Van Solingen, A. († 1830).
Vrolick, G. (1775-1859).
Vrolick, W. (1801-1863).
Barth de la Faille (1795-1867).
Thomas, Simon (Leyden, 1820-1880).
Van Hueval, (1802-1883). Pelvimeter.

Swedish.

Cederskjöld (1782-1848).

Discovery of the plant cell, 1838, by Schleiden; the animal cell, by Schwann; also of **human parasites, as in scabies.** Systems: Excitation theory, stimulation and counter-stimulation, homœopathy, isopathy, cranioscopy, physiological medicine (Broussais), diagnosis by means of pathological anatomy, neglecting the history. School of natural philosophers. Kieser: Disease-parasites. School of natural historians (Schönlein). Vienna school: Rokitansky: Dyscrasiology. Physiological medicine (Roser, Griesinger, Wunderlich). Rational medicine (Henle-Pfeuffer). Theories of Rademacher. Cellular pathology (Virchow). Theory of monadic fungi (Hueter). Antiseptics: Lister.

Obstetrics: The best work on the history of midwifery, by E. C. J. von Siebold, Göttingen.

In conclusion we give a *résumé* of the text-books and the compendia upon obstetrics and midwifery which have appeared in the last ten years, arranged according to their nationality:—

GERMAN TEXT-BOOKS.

Spoendli: "Schwangerschaft, Geburt und Wochenbett." 2. Auflage. Zürich, 1879. 8vo.

Spaeth, J.: "Lehrbuch der Geburtshülfe für Hebammen." 3. Auflage. Wien, 1880. 4. Auflage. Vienna, 1886. 8vo.

Schroeder, K.: "Lehrbuch der Geburtshülfe mit Einschluss der Pathologie der Schwangerschaft und des Wochenbetts." 6. Auflage. Bonn, 1880. 7th Edition, 1882. 8th Edition, 1884. 9th Edition, 1886.

Kleinwächter, L.: "Lehrbuch der Hebammenkunst." Innsbruck, 1879. 8vo.

Spiegelberg, O.: "Lehrbuch der Geburtshülfe für Aerzte u. Studirende." 2d Edition, finished by Wiener. Lahr, 1880–82. 8vo.

J. H. Haake: "Compendium der Geburtshülfe zum Gebrauche für Studirende und Aerzte." 2d Edition. Leipzig, 1880. 8vo. 3d Edition, 1887.

Martin, Ed.: "Lehrbuch der Geburtshülfe für Hebammen." Revised and published in 4th Edition, by A. Martin, Stuttgart, 1880.

Lange, Wilh.: "Lehrbuch der Geburtshülfe für Hebammen." 5th Edition. Leipzig, 1880.

Kleinwächter, L.: "Grundriss der Geburtshülfe für prakt. Aerzte u. Studirende." 2d Edition. Vienna, 1881.

Credé und Winckel: "Lehrbuch der Hebammenkunst." 3d Edition. Leipzig, 1882. 4th Edition von Credé-Leopold, 1886.

Kormann, E.: "Lehrbuch der Geburtshülfe für Aerzte u. Studirende." Tübingen, 1884.

Fehling, H.: "Lehrbuch der Geburtshülfe für Hebammen, auf Grund der 14. Auflage von F. K. Naegele's Lehrbuch." Tübingen, 1883.

Cohnstein, J.: "Grundriss der Geburtshülfe für Aerzte u. Studirende." 2. Auflage. Berlin, 1885.

Zweifel, P.: "Lehrbuch der Geburtshülfe für Aerzte u. Studirende." Stuttgart, 1887.

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Hubert, Eugène: "Cours d'accouchements professé à l'université catholique de Louvain." 2 vol. Louvain, 1878. Baillière et fils. 8vo. 3d ed., 2 vols., 1885. Fonteyne.

Louet, Eugène: "Guide administratif du médecin accoucheur et de la sage-femme." Paris, 1878. G. Baillière. 12mo.

Verrier, E.: "Manuel pratique de l'art des accouchements." 3^e édition. Paris, 1879.

J. A. H. **Depaul**: "Leçons de clinique obstétricale professées à l'hôpital des cliniques (Red. par le Dr. Soyre)." 2 fasc. Paris, 1879. 8vo.

Playfair, W. S.: "Traité théorique et pratique de l'art des accouchements." Traduit sur la 2e éd. anglaise. Paris, 1879. 8vo.

Guernsey, H. N.: "Traité obstétrique et des maladies spéciales aux femmes et aux enfants basé sur les principes et la pratique de l'homeopathie, traduit sur la 3e éd. américaine par le Dr. Fernand Chauvet." Paris, 1880. Baillière et fils. 671 pp. 8vo.

Naegele, H. F., et W. L. **Grenser**: "Traité pratique de l'art des accouchements. 2e éd. française, traduite sur la 8e et dernière édition allemande, annotée et mise au courant des derniers progrès de la science, par G. B. Aubenas, ouvrage précédé d'une introduction par J. A. Stoltz." Paris, 1880. J. B. Baillière et fils. 848 pp. 8vo.

Chantreuil, G.: "Clinique d'accouchements. Leçons faites à l'hôpital des cliniques. Suppléant M. le professeur Lepaul et recueillies par M. le Dr. Lordereau." Paris, 1881. A. Delahaye et E. Lecrosnier. 103 pp. 8vo.

Lenoir, A., M. Séc., et S. **Tarnier**, "Atlas de l'art des accouchements." Corbeil, 1882. 4to.

Charpentier, A.: "Traité pratique des accouchements." Tome I. Paris, 1883. J. B. Baillière et fils. 1073 pp. Tome II, 994 pp. 8vo.

Delore et **Lutaud**: "Traité pratique de l'art des accouchements." Paris, 1883. F. Savy. 560 pp. 8vo.

Pénard, **Lucien**: "Guide pratique de l'accoucheur et de la sage-femme." 6e éd. Paris, 1883. J. B. Baillière et fils. 705 pp. 8vo.

Jallet, A.: "Précis d'accouchements à l'usage des étudiants et des sages-femmes." Paris, 1884. A. Delahaye et E. Lecrosnier. 183 pp. 8vo.

Lusk, W. T.: "Science et art des accouchements." Ouvrage traduit sur la dernière édition américaine et annoté par le Dr. Doleris, precédé d'une préface par le Professeur Pajot. Paris, 1885. G. Steinheil. 834 pp. 8vo.

Corre, A.: "Manuel d'accouchement et de pathologie puerpérale." Paris, 1885. Doin. 18.

Gallois, **Ernest**: "Manuel de la sage-femme et de l'élève sage-femme." Paris, 1886. J. B. Baillière et fils. 648 pp. 8vo.

Hubert, **Eugène**: "Cours d'accoucher." 3e éd. revue corrigée augmentée. 726 pp. 1885.

Barnes, **Robert**, et **Fancourt Barnes**: "Traité théorique et clinique d'obstétrique médicale et chirurgicale." Traduit par A. E. Cordes. Paris, 1886. Masson. 978 pp.

ENGLISH AND AMERICAN TEXT-BOOKS.

Marsden, J. H.: "Handbook of Practical Midwifery, including full instructions for the Homœopathic treatment of the disorders of pregnancy and the accidents and diseases incident to labor and the puerperal state." New York, 1879. Boericke & Tafel. 323 pp. 8vo.

Barnes, **Fancourt**: "A Manual of Midwifery for Midwives and Medical Students." Philadelphia, 1879. H. C. Lea. 201 pp. 12mo.

——— ———: "A Manual of Midwifery for Midwives." London, 1879. Smith, Elder & Co. 187 pp. 8vo.

Roberts, D. L.: "The Student's Guide to the Practice of Midwifery." 2d ed. London, 1879. 3d ed. 1884.

Leishman, **Wm.**: "A System of Midwifery, including the Diseases of Pregnancy and the Puerperal State." 3d Am. ed., revised by the author. With additions by John S. Parry. Philadelphia, 1879. H. C. Lea. 732 pp. 8vo.

PLAYFAIR, W. S.: "A Treatise on the Science and Practice of Midwifery." With notes and additions by Robert P. Harris. 3d Am. ed., Philadelphia, 1880. H. C. Lea. 682 pp. 4th Am. ed., Philadelphia, 1885.

SWAYNE, J. G.: "Obstetrics Aphorisms for the use of students commencing midwifery practice." 9th ed., Philadelphia, 1888. 159 pp. 12mo. P. Blakiston, Son & Co.

PLAYFAIR, W. S.: "A Treatise of the Science and Practice of Midwifery." 3d ed. 2 vols. London, 1880. 8vo. , 6th ed. 2 vols. 1886.

BURTON, J. E.: "Handbook of Midwifery for Midwives," from the official "Handbook of Midwifery for Prussian Midwives." Published by direction of the Minister for Spiritual, Educational and Medical Affairs. London, 1880. 12mo.

GLISAN, R.: "Modern Midwifery," a text-book of American practice. Philadelphia: P. Blakiston, Son & Co., 1881. 8vo.

REYNOLDS, J. J.: "Note on Midwifery," specially designed to assist the student in preparing for examination. London, 1881. 12mo.

LUSK, W. T.: "The Science and Art of Midwifery." New York, 1882. 8vo.

KING, A. F. A.: "A Manual of Obstetrics." Philadelphia, 1882. H. C. Lea's Son & Co. 326 pp. London, 1883. 325 pp. 8vo. 2d ed. 358 pp. Philadelphia, 1884. 3d ed., 1886.

MEADOWS, A.: "A Manual of Midwifery," including the signs and symptoms of pregnancy, obstetric operations, diseases of the puerperal state, etc. 3d Am. ed. Philadelphia, 1882. 8vo.

LEAVITT, S.: "The Science and Art of Obstetrics," with an introduction by R. Ludlam. Chicago, 1883 (1882). 8vo.

BARNES, ROBT.: "A Synoptical Guide to the Study of Obstetrics," being an aid to the student in the class room, in private study and in preparing for examinations. London, 1883. Smith, Elder & Co. 128 pp.

NALL, SAMUEL: "Aids to Obstetrics." Double part. London, 1883. Baillière. 140 pp. 12mo.

CONANT, CLARENCE M.: "An Obstetric Mentor." A handbook of homœopathic treatment required during pregnancy, parturition and the puerperal season. New York, 1884. A. L. Chatterton. 212 pp. 8vo.

BARNES, R. & F. BARNES: "A System of Obstetric Medicine and Surgery, Theoretical and Clinical, for the Student and the Practitioner." Vol. I. London, 1884. Smith & Elder. 8vo. Vol. II. London, 1885. 751 pp. 8vo.

VERRIER, E.: "Practical Manual of Obstetrics." Fourth edition, enlarged and revised. With four obstetric tables by Prof. Pajot. First American edition, with revision and annotations by E. L. Partridge. New York, 1884. W. Wood & Co.

MILNE, ALEX.: "The Principles and Practice of Midwifery," with some of the diseases of women. Second ed. New York and London, 1884. Bermingham & Co. 371 pp. 12mo.

LUSK, W. T.: "The Science and Art of Midwifery" (a new edition from second American). London, 1884. Lewis. 715 pp. 8vo.

PARTRIDGE, EDWARD L.: "A Manual of Obstetrics." New York, 1884. Wm. Wood & Co. 305 pp. 24mo.

SMITH, HENRY F.: "The Handbook for Midwives." Second edition. London, 1884. Longmans, Green & Co. 176 pp. 12mo.

CAZEAUX AND TARNIER'S "Midwifery." With Appendix, by Mundé. Eighth revised and enlarged edition. With colored plates and numerous other illustrations. "The Theory and Practice of Obstetrics;" including the diseases of pregnancy and parturition, obstetrical operations, etc. By P. Cazeaux, Member of the Imperial Academy of Medicine; Adjunct Professor in the Faculty of Medicine in Paris. Remodeled and rearranged, with revisions and additions, by S. Tarnier, M.D., Professor of Obstetrics and Diseases of Women and Children in the Faculty of Medicine of Paris. Eighth American, from the eighth French and first Italian edition. Edited and enlarged by Robert J. Hess, M.D., Physician to the Northern Dispensary, Philadelphia, etc., with an Appendix by Paul F. Mundé, M.D., Professor of Gynæcology at the New York Polyclinic, and at Dartmouth College; Vice-President American Gynæcological Society, etc. Illustrated by chromo-lithographs, lithographs, and other full-page plates, seven of which are beautifully colored, and numerous wood engravings. *Students' edition.* One vol., 1084 pp. 8vo. Phila. P. Blakiston & Co.

GALABIN, A. L.: "A Manual of Midwifery." Phila.: P. Blakiston, Son & Co. 1886. 750 pp. 12mo.

LANDIS, H. G.: "A Compend of Obstetrics." Fourth edition. Phila.: P. Blakiston, Son & Co. 1889.

PARVIN, THEOPHILUS: "The Science and Art of Obstetrics." Phila., 1886. 701 pp.

DANISH TEXT-BOOKS.

STADFELDT, A.: "Laerebog for Jordemodre." 2. Udgave, Kjobenhavn, 1880. (Manual of Midwifery.)

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JERZYKOWSKIEGO, S.: "Wyklad poloznictwa wydane w. poznanin" (Manual of Obstetrics). Warszawa, 1879.

RUSSIAN TEXT-BOOKS.

SPIEGELBERG: "Uchebnike aku cherstva dija vrachei i uchatchesja pere B. Jaupolskajo." St. Petersburg, 1879. 8vo.

JIJSLENKO: "Handbuch der Geburtshülfe für Hebammen." St. Petersburg, 1885. 250 pp. 8vo.

BIDDER, E.: "Elemente der Geburtshülfe für Hebammen." St. Petersburg, 1886. 1 Band.

JASINKI, P. A.: "Akusherstov. Geburtshülfe." Charkow, 1886.

ISPOLATOV, PRAUT: "Handbuch der Geburtskunde." Moscow. 137 pp. 8vo.

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ISHIGURO: Uebersetzung des K. Schroeder'schen Werkes.

HUNGARIAN TEXT-BOOKS.

KEZMAZSZKY, T. A.: "Szüleszet tankönyve bábák szanára" (Handbuch für Hebammen). 2d ed. Budapest, 1882.

ITALIAN TEXT-BOOKS.

CAZEAU E TARNIER. Tratato teorico-pratico di Ostetrica. Prima versione Italiana sulla 8ª francese, con note ed appendice dei professori Porro, Tibone, Chiara, Morisani e Pasquale; Vallardi. Napoli. Roma. Milano.

KLEINWÄCHTER, L.: "Compendio di ostetricia ad uso delle levatrici." Innsbruck, 1881. 8vo.

SCHROEDER, C.: "Manuale di ostetricia," trad. sopra la VI ed. da G. Rocca, con prefaz. ed aggiunte di Domenico Tibone. Fasc. I. Milano, 1881. 8vo. 2d ed. Milano, 1883. 8vo.

BRAUN, G. A.: "Manuale di ostetricia." Traduzione del dottore A. Raffaele con addizioni del dottore O. Morisani." 2d ed. Napoli, 1882. 8vo.

VITTORELLI, C.: "Manuale di ostetricia ad uso delle levatrici." Napoli, 1883.

MORISANI, OTTAVIO: "La ostetricia in quadri si nottici da servire come guida ai pratici ed agli studenti." 3d ed. Napoli, 1885. G. Jovene. 18 charts. 8vo.

BARNES, FANCOURT: "Manuale di ostetricia ad uso delle levatrici," traduzione sulla 2 edizione inglese, con aggiunte del dott. G. Chiarleoni. Milano, 1885. Fratelli Dumolard. 8vo.

SPANISH TEXT-BOOKS.

CAMPA, F. DE P.: "Tratado completo de ostetricia." Valencia, 1879. 4to. 2d ed. Tomo primero. Valencia, 1885. P. Aguilar. 559 pp. 8vo.

1. Of compends there have appeared—in Germany, 2, in France, 5, in England, 7; America, —; Denmark, —; Poland, —; Russia, 1; Hungary, —; Italy, —; Spain, —.
2. Text-books for students and physicians: in Germany, 6; France, 5; England, 5; America, 8; Denmark, —; Poland, 1; Russia, 1; Hungary, —; Italy, 1; Spain, 1.
3. Text-books for midwives: in Germany, 7; France, 3; England, 1; America, —; Denmark, 1; Poland, —; Russia, 2; Hungary, —; Italy, 1; Spain, —.
4. Translations of foreign works in Germany, none; in France, 5; in England, 2; in America, 5; in Denmark, none; in Poland, none; in Russia, 2; in Hungary, none; in Italy, 4; in Spain, none.

PART I.

PHYSIOLOGY AND MANAGEMENT OF PREGNANCY.

SECTION I.

Anatomy and Physiology.

LITERATURE.

Hensen: "Physiologie der Zeugung." Leipzig, 1881, S. 113. His: "Anatomie menschlicher Embryonen," Abtheilung I und II. Leipzig, 1882. Loewenthal: "Eine neue Deutung des Menstruationsprocesses." *Arch. f. Gynäk.*, XXIV, 168, 1884. Wyder: "Beiträge zur Lehre von der Extrauterinschwangerschaft und dem Orte des Zusammentreffens von Ovulum und Spermatozoen." *Arch. f. Gynäk.*, XXVIII, 325, 1886. Marion Sims: "Klinik der Gebärmutterchirurgie," Deutsch übersetzt von Beigel. II Aufl. Erlangen. Percy: *American Med. Times*, March 9th, 1861. Bischoff: "Entwickelung des Kanincheneies:" Preisschrift, 1842; des Hundeeies, 1845, in Henle und Pfeuffer's *Zeitschrift f. rat. Medicin*, Neue Folge IV, 155. Hausmann: "Ueber das Verhalten der Samenfäden in den Geschlechtsorganen des Weibes." Berlin, 1879. Mayrhofer: Billroth's "Handbuch der Frauenkrankheiten." II Abtheilung. I Aufl., p. 18.

CHAPTER I.

Definition—Commencement of Pregnancy—Time and Site of Fecundation.

Pregnancy may be defined as that condition of the female which exists when a fecundated ovum is lodged within her uterus.

Reproductive power in woman is not usually present until the sexual organs have attained their full development and the processes known as ovulation and menstruation have become manifest. Although there is an intimate relation between these processes, yet they may occur independently of each other, as is shown by pregnancy in young girls who have never menstruated, and in nursing women before the return of their menses. According to Marion Sims, conception is possible even after the menopause.

The time of life at which the power of reproduction becomes established varies considerably in different climates; in our climate it is from the thirteenth to the fifteenth year.

It has not yet been definitely determined whether each menstruation is accompanied by the bursting of a Graafian follicle, or just at what time the ovum makes its exit. Bischoff maintains that individual peculiarities have a governing influence, although normally the two processes are probably inseparable; and this view is supported by more recent investigators.

The woman becomes pregnant at the moment the spermatozoa penetrate the ovule and lead to the subsequent changes therein. In order to arrive at anything approaching a definite conclusion in regard to this point, several questions must be considered. These are:—

(1) May cohabitation cause the bursting of a Graafian vesicle and consequent exit of the ovule?

(2) How long does the spermatic fluid remain within the female organs before it loses its specific power?

(3) How long may the ovule remain in the Fallopian tube and uterus without losing the power of conception?

(4) Where do the spermatozoa and ovule usually meet?

Observations upon the rabbit have shown that copulation may accelerate, if not immediately cause, the discharge of the ovule, and it is therefore possible that this may also be the case in man (*Slaviansky*). This is difficult to prove, but is to be regarded as a possibility.

With regard to the vitality of the spermatic fluid, B. Haussmann observed movements in spermatozoa discharged from the cervix five to seven and a half days (according to Percy, eight and a half days) after the last cohabitation, showing their duration of life at this point to have been over a week. In the acid secretions of the vagina, however, small quantities lose their vitality in a very short time.

It has not yet been determined definitely how much time elapses during the passage of the ovule through the Fallopian tube; but that it may take several days is shown by the above experiments upon animals, the time consumed being from three to five days (*Hensen*).

Contact between the spermatic fluid and the ovule depends upon various circumstances, viz.: the place of ejaculation and the ejaculatory power, the activity of the vagina and uterus, as well as the movements of the spermatozoa themselves.

It has been proved that the semen may reach the ovule and cause pregnancy when the emission has taken place at the entrance of the vagina, without introduction of the penis into the vagina itself. It is also believed that during cohabitation the uterus is pressed down nearer to the entrance of the vagina and held there by the abdominal muscles, thus rendering it more accessible.

The contractions of the vagina during and after coition facilitate the passage of the spermatozoa toward the neck of the uterus. Contractions of the uterus are also said to take place (*Beck*) which result in a protrusion of the thick cervical mucus and an aspiration of the spermatic fluid.

It has been shown conclusively that a single coition, while the woman is unconscious or under the influence of ether or chloroform, may result in pregnancy (*Marion Sims*), but this is not a positive proof of the non-participation of the uterus, owing to the short duration of the conditions mentioned.

The power of motion of the spermatozoa is very important. They are said to move at the rate of 1.2 to 2.7 mm. per minute (*Henle, Kramer, Hensen*), while Lott finds it to be 3.6 mm. per minute. At this rate they might easily pass into the Fallopian tubes in a very few minutes. The seat of contact between the ovule and sperma is thought by Henle and most authors to be the outer third of the Fallopian tube, where the deep pouches, or receptacula seminis of Henle, afford a safe lodging place for the spermatic fluid. He believes the beginning of the Fallopian tube to be the sole seat of fecundation, and frankly says he thinks we have no reason for doubting this theory. In case fecundation takes place, the semen must have reached this point before it comes in contact with the ovule. Coste has also shown that the ovule of the rabbit loses the power of fecundation, owing to the albuminous envelope which surrounds it after passing through the upper section of the tube, and guards it against the penetration of the spermatozoa. This, however, is not necessarily the case with the human ovule; on the contrary, everything leads us to believe that the ovule outlives the spermatozoa. Loewenthal, on the other hand, thinks that, under ordinary circumstances, fecundation usually takes place in the uterus itself, the unfecundated ovule being already imbedded there, and in support of this view cites the fact that although spermatozoa have been found in the human uterus, they have never been discovered either in the tubes or on the ovaries, where they would be observed if the theory of their passage beyond the uterus with each coition were the correct one. Mayrhofer and Wyder also believe the uterus to be the seat of fecundation, owing to the direction of the cilia in the uterus (upward) and tubes (toward the uterus). Of course this may be possible, but we have no reason for supposing that man alone differs from animals in this respect, for we know that extra-uterine pregnancy is much more frequent than it was formerly thought to be, and fecundation in the tubes or ovaries has been positively proven to be by no means rare.

The mature human unfecundated ovule has a diameter of 0.18 to 0.2 mm., while that of the uterine end of the tube is usually 2 to 3 mm. transversely. The ovule, however, grows very rapidly after fecundation, reaching a diameter of 3 to 6 mm. as early as the second week, so that it must pass through the isthmus tubæ, at the latest, five or six days after fecundation, otherwise the passage would be too small for it.

From the foregoing it will be seen that in calculating the beginning of pregnancy the following possibilities may present themselves: 1. The ovule may not have left the ovary at the time of cohabitation, nor be set free during the act. In this case impregnation would take place at the next ovulation, providing the period of time which shall elapse between the coitus and following ovulation be not too long. 2. The ovule may be (*a*) free at the time of cohabitation, and become fecundated at once, or (*b*) it may be set free by the bursting of the follicle during the act, becoming speedily impregnated. 3. The ovule may be situated at some point within the genital canal, and not be reached by the spermatozoa until some time after cohabitation. As we have seen above, this may occur more than a week after the coitus.

It was formerly thought that the ovule impregnated was that which escaped during the last menstruation. In 1871, however, Sigismund's theory, backed by anatomical and clinical observation, gained the ascendancy. According to this view, the ovule inseminated is that which would have escaped during the next menstruation, had the woman not become pregnant, and not that of the last preceding menses. More recently His has found, by careful examination of sixteen embryos, that in twelve the stage of their development showed them to be the result of impregnation at the time of the first missing menstrual period, while the four others corresponded to the last preceding menses, thus proving that both suppositions are possible, and it only remains to prove, by a more extended series of observations, which is of more frequent occurrence.

CHAPTER II.

Impregnation and the Changes in the Ovum in the First Four Weeks.

LITERATURE.

Hensen: *loc. cit.* His: *loc. cit.* O. und R. Hertwig: "Ueber den Befruchtungs- und Theilungsvorgang des thierischen Eies. Jena, 1887.

Impregnation is accomplished, in all probability, in the following manner: The germinal vesicle of the ovum loses the germinal spot, approaches nearer to the zona pellucida and becomes spindle-shaped; the peripheral pole of this spindle passes through the zona pellucida, forming two bud-like processes upon its surface (Richtungskörperchen). These bodies are then cast off and have nothing further to do with fecundation, while the central end of the spindle wanders back to the middle of the ovum, and is called the female pronucleus. The spermatozoön now insinuates itself into the ovum and loses its head and tail. The remaining or middle portion swells up and forms the male pronucleus (Spermakern). These two, male and female pronuclei, then join together to form the new nucleus of the fecundated ovum. The entering spermatozoön is also accompanied by protoplasm, and it seems credible that, as it enters the ovum as a formed element, it probably acts as such. According to O. and R. Hertwig, it is only after a thorough interchange of the substances composing the male pronucleus and the ovum has taken place, that the nuclei are formed which are equipped with the vital force necessary to further development, and the normal culmination of fecundation is then brought about by rhythmical contraction of the plasma, which brings the nuclei together. The entrance of other spermatozoa is now prevented by the formation of an albuminous coating, resulting from the irritation of the plasma of the ovum, caused by the entrance of the spermatozoön.

Segmentation now begins and the *mulberry body* or *morula* is formed. These cells then recede to the inner surface of the zona pellucida, building a continuous layer, the blastodermic membrane, a part of which thickens, projects from the surrounding surface, and gradually becoming more constricted, finally forms the embryo, while the rest of the structure is called the umbilical vesicle. The constricted portion connecting these two represents the *vitelline passage or duct* (ductus omphalo-mesentericus). The original single layer of the germinal vesicle now becomes the external blastodermic membrane or *ectoderm*, from which the nervous system, the organs of special sense and the skin are developed. The *entoderm* or internal blastodermic membrane develops inside of this and forms the starting point of the intestinal epithelium and gland cells. At this point the ectoderm thickens and the *primitive trace* appears upon it, representing the axis of the embryo, whereupon the third or intermediate blastodermic layer, the *mesoderm*, begins to develop, and lays the foundation for the muscles, connective tissue, vascular system and organs of generation.

Up to the present time, the smallest human ovum known is that described by Reichert, which was 5.5 mm. in its long diameter and 3 mm. in the short diameter, while its embryonic spot was turned toward that part of the uterine wall which was destitute of chorionic villi for a space of 2.5 mm.

The other ova described by Wharton, Jones and Breuss seem smaller in their measurements, but they had lain in alcohol or glycerin before they were measured.

A fresh ovum examined by me when about fourteen days old weighed 0.82 gm., and measured in length, breadth and thickness, without decidua vera and reflexa, about 16 mm. The quantity of amniotic fluid equaled six medium-sized drops (= 0.4 gm.), and the embryo was 3.5 mm. long (see Fig. 1). The youngest ova in His's tables, the embryos of which were 3 to 4 mm. long, and about three weeks old, showed in most cases, inclusive of villi, a diameter of less than 10 mm., the maximum reaching 15 mm. In embryos of the fourth week, of from 4 to 8 mm. in length, the figures were mostly in the neighborhood of 2 cm., and His gives the following normal relations, according to the size of the chorion.

FIG. 1.

Ovum at 14th day without decid. vera and circumflexa. Natural size.

Chorion under 15 mm.	Embryo from 2-4 mm. long.
" of 15-30 "	" " 4-10 " "
" " 25-40 "	" " 10-15 " "
" " 35-50 "	" " 15-20 " "
" " 40-60 "	" " 20-25 " "

In the first stage of the development of the embryo, the blastodermic vesicle presents the embryonic spot from the inner surface of which a mass of cells is seen projecting forward (germinative elevation [Keimhügel] of Hensen).

In the second stage the *embryonic spot* stretches out, becoming pear-shaped and the *primitive groove* appears. The third stage is marked by the formation of the *dorsal laminæ*, and the anterior germinal fold becomes more pronounced.

It is a peculiar fact that the human ovum, at this early period, shows a closed amnion, a complete chorion, and a thick pedicle connecting the latter with the embryo. The fourth stage is marked by the folding over of the anterior germinal folds, thus forming a head with its face directed toward the abdomen. At the same time, the dorsal plates become more sharply defined, their edges arch over and meet in places, thus giving the first traces of the primitive vertebræ. In the fifth stage the medullary tube is almost completely closed, the primitive vertebræ are more sharply defined and their number increases. Near the cephalic region, the form of the heart begins to be perceptible externally. In the sixth and seventh stages the brain and spinal cord are inclosed, and the heart is represented by a tube which departs from the universal symmetry by curving to the right. The chorda dorsalis and primitive vertebræ are sharply defined, the primitive ureters in the process of formation, the abdomen still wide open, showing the intestinal tube as a long groove connected with the umbilical vesicle. The cephalic extremity has not yet arched over forward. The parts representing the forehead, face and occiput are seen linked together, the two latter when seen in profile showing the folds for the formation of the first two mandibular plates. The buccal cavity is simply an open excavation, and the caudal extremity of the body forms a short stump which projects over the abdominal pedicle. The embryo at this time is from 2.45 to 5 mm. long. In the eighth stage the cephalic extremity begins to curve over and twists to one side, so that the middle cerebral vesicle becomes the highest point. The convexity of the rudimentary heart descends lower down and the auricles are formed. The mandibular arches and clefts are now visible, and the closure of the intestine is more complete, but the connection with the umbilical vesicle is quite extensive. The caudal extremity of the trunk is still curved forward anteriorly with the abdominal pedicle pinched in between it and the root of the umbilical vesicle. This arching of the body increases in the ninth stage, the development of the brain is more advanced and the hemispheres are distinguishable. The passage leading to the umbilical vesicle narrows, while above the umbilicus the liver begins to show itself. The rudimentary extremities are hardly yet perceptible, but finally develop during the tenth stage. Stages 1 to 5 correspond to the 12th to the 16th days, stages 6 to 8, from the 16th to the 18th days, stages 9 to 10 to the end of the 3d and 4th weeks. According to His the embryo reaches a length of from 7 to 7½ mm. by the end of the first month, and this is confirmed by most other observers.

. CHAPTER III.

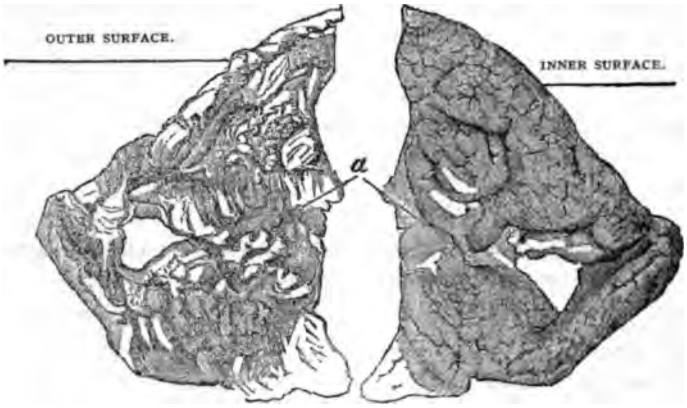
Formation of the Placenta—The Membranes of the Ovum and the first Changes in the Uterus and the adjacent Organs.

LITERATURE.

Charpentier: "Traité prat. des accouch.," 1, 112–130, 1883. Holst: "Beiträge zur Gynäkol. und Geburtskunde." II Heft. 1867, p. 76 ff. Martin Overlach: "Die pseudomenstruirende Mucosa Uteri." Inaug. Diss. Munich, 1885. C. Ruge, in K. Schröder's "Der schwangere und kreissende Uterus." Bonn, 1886. Spiegelberg: "Lehrbuch," II Auflage. Waldeyer: *Centralblatt für Gynäkologie*, 1887, p. 223. Wiener: "Verhandlungen des ersten deutschen Gynäkologen-Congresses in München". 1886.

As soon as the impregnated ovum has reached the uterus, a series of fine villi form upon the hitherto smooth chorion, and soon the entire surface is covered by a thick, shaggy coat (chorion frondosum). The closing in of the embryo from all sides by means of the amnion now commences, as mentioned, about the twelfth to the sixteenth day, and a sac is formed filled with a liquid which is at first a simple serous fluid. The inner surface of the amnion is covered with epithelium from the ectoderm, while the connective-tissue stroma is derived from the mesoderm. From the posterior end of the embryo now arises a prolongation of the ectoderm, which pushes the mesoderm, or more correctly, the fibro-muscular layer, before it like a sac, the convexity of which projects forward into the abdominal cavity, and finally reaches the under side of the embryo. This sac, the allantois, grows from the caudal extremity and insinuates itself between the amnion and the vitelline membrane until it reaches the inner surface of the chorion frondosum. It is accompanied by two arteries, arising from the ends of the aorta, which send well developed capillary loops, accompanied by the serous coat, into the tufts of the chorion. These latter grow into the mucous membrane of the uterus, and the point at which this union takes place marks the site of the future placenta. In the meantime the mucous membrane of the uterus has become very hyperæmic and prepared for the reception of the ovum. At the time of conception the uterine glands begin to enlarge and give the mucous membrane an uneven appearance (see Fig. 2). The epithelial cells of the surface enlarge greatly, while round spaces or vacuoles form in the granulated protoplasma, and each cell in the meantime divides into numerous (twelve or fifteen) nuclei or "daughter cells;" these retreat into the vacuoles and, gradually passing deeper down, finally make their exit through an opening in the protoplasma and reach the underlying connective

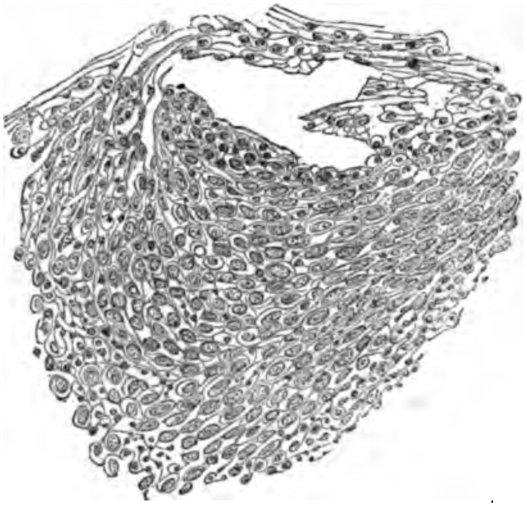
FIG. 2.



a, Connecting fold.

Decidua of pregnancy at the second month. Taken from a case of extra-uterine pregnancy Frau S. 27, IV., 87. (Natural size.)

FIG. 3.

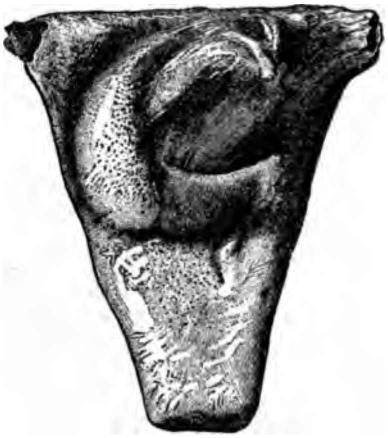


Decidua vera from Fig. 2. × 330.

tissue, the fine fibres of which close in around the daughter cells, and subsequently play a part in the process of delivery.

The cells of the decidua are thus seen to be products of the uterine epithelium and are most numerous near the surface, but permeate the entire mucous membrane, and even in some cases wander deep down into the muscular tissue (*M. Overlach*). It appears that the epithelium of the upper part of the cervix also participates in the formation of the decidual cells. The *decidua menstrualis* becomes the decidua vera (Fig. 3). The ovum now lodges in one of the depressions of this decidua vera and is soon enveloped by folds which grow up from all sides of the mucous membrane. This process is completed about twelve to fourteen days after the migration of the ovum into the uterus. The decidua vera was formerly thought to be an exudation shutting off the connection between the tubes and the cavity of the uterus; it was then supposed that the advancing impregnated ovum pushed the decidua before it into the cavity of the uterus and, passing behind it, thus reached the wall of the uterus. For this reason this was called the decidua reflexa, and it was supposed that a new decidua, or decidua serotina, formed at the point where the ovum had imbedded itself. The fallacy of this view is now universally acknowledged, and therefore it were wiser to abandon this terminology and designate the d. serotina simply as d. vera, and the d. reflexa as d. circumflexa or circumcludens (*Zweifel*). (Fig. 4.)

FIG. 4.



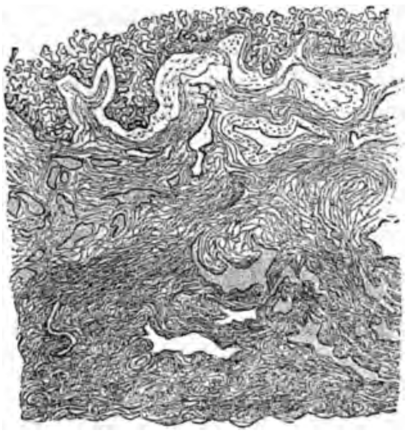
Ovum at sixth to seventh week, enveloped by decidua vera and circumflexa The three openings of the decidua plainly visible. (Two-thirds natural size.)

The surface of the d. circumflexa which is turned toward the ovum is uneven and pitted, while its outer surface is smooth; its structure is the same as that of the d. vera. As regards the nutrition of the fœtus, the relation which exists between the vessels of the chorionic villi and those of the mother is not yet thoroughly understood. According to the older theories, there were primary villi which first established the connection between d. serotina (vera) and chorion, then perforated into the large maternal sinuses and extended free into the vascular system of the mother, the blood within them being aërated by the maternal blood; the epithelium and embryonic tissue of the villus as well as the wall of the capillary being interposed between the two fluids.

The more recent investigators maintain that the intervillous spaces likewise contain maternal blood, which, however, is not derived directly from the maternal vessels, inasmuch as they are bounded by the fœtal envelopes (*Wiener*). Hoffmann claimed that the intervillous spaces were filled with a sort of uterine milk, but this was disproved by Werth. On the other hand, all authors agreed that no blood was to be found between the villi in the first months, and that the nutritive material of the embryo and fœtus was derived solely by osmosis from the decidua. More recently, Carl Ruge asserts that this relation persists unchanged during the later months of pregnancy, that there is no blood in the intervillous spaces, and, consequently, no intervillous circulation, and that the nutrition of the fœtus is dependent upon osmosis with the decidual circulation, since there exists a fœtal decidual vascular system. Whether this be simple osmosis or an emigration of corpuscular elements, is held by Ruge to be still in doubt. The primary villi are thought to be more simple at first (villi of agglutination), becoming, later on, rounded processes which penetrate deeper into the cellular layer of the decidua ("Haftzotten," or anchoring villi). Still another set of villi exists, however, easily differentiated from the large decidual cells by their small star- or spindle-shaped elements, which, after entering the decidua serotina, run almost parallel to its surface. Large and small vessels penetrate the decidua by means of the anchoring villi, and the decidual villi show superficial and deep, large and small vessels. Often only a thin cellular layer separates the contents of the vessels from the intervillous space. Vessels are also seen with openings upon the free surface, while bridge-like and U-shaped villous vessels traverse the decidua and even form a sort of collateral circulation. The epithelial covering of the villi of agglutination is usually intact, and the circulation confined to the villi in most cases, although fine capillary loops can be seen passing between the epithelia into the maternal tissue.

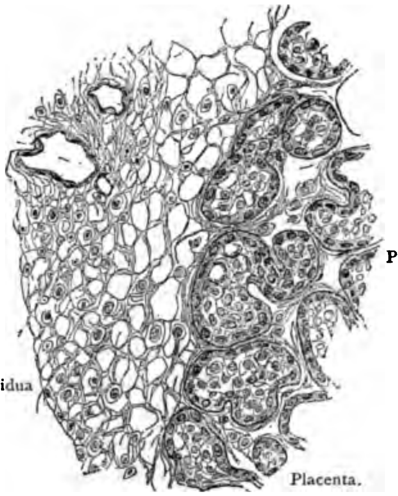
Furthermore, Ruge likens the decidua vera and serotina to the inflamed and proliferated mucous membrane, and thinks a separation of the two into cellular and glandular layers impracticable during the earlier months. Later on, both become thinner, the glands of the superficial strata of the mucous membrane disappear, and the cellular and ampullar layers become more distinct. In the last months the decidua vera almost disappears. The decidua serotina of the later months is thickly beset with villi, and contains fœtal blood-vessels in its superficial layers, so that a superficial chorionic layer might be assumed. Glandular spaces, however, are rare, and no spongy layer is to be seen. The epithelia lining the spaces of the decidua, resembling the epithelia of the villi, have been formed by extension of the investing layers of the villi into the decidual tissue, in a word, by proliferations from the epithelial fringes of the villi themselves. Muscular fibres do not penetrate the decidua. Waldeyer, however, lessens the value of the above description of Ruge, by proving that in five cases maternal blood was found between the villi; yet that these do not come into direct contact with the fluid, but pass into the endothelial tubes, which have been proven to be continuations of the convoluted arteries of Waldeyer, and are also invested by this endothelial covering in the intervillous spaces.

FIG. 5.



Boundary line between placenta and decidua. × 10.

FIG. 6.



Section through placenta and decidua. × 330.

Figs. 5 and 6, for which, with the foregoing, I am indebted to Dr. Ziegenspeck, are intended to show the relation between the villi and decidua serotina. Fig. 6 represents a section through the placenta and decidua, under a higher power, death having been caused by air embolism. To the right are the villi of the chorion (placenta), to the left the decidua with its sinuses and vessels. Maternal tissue provided with cells, which are poor in chromatin, surrounds each villus and is continued into the spaces between them. These changes in the mucous membrane of the uterus are also accompanied by changes in its muscular fibres, but, unfortunately, we are not in possession of measurements of the dimensions of the organ from which average values might be deduced for the first weeks of pregnancy. Reichert and Kollmann's cases are the only ones at our disposal in this direction.

In Reichert's case, whose ovum he judged to be two weeks old, the measurements of the uterus were as follows:—

Length,	8	cm.
Width,	5.5	"
Thickness (left),	3.5	"
" (right, where ovum was located),	4.5	"

In Kollmann's case, which was similar, the uterus was 8.6 cm. long. The volume increases in length, breadth and thickness, and is due not alone to overfilling of the vessels, but to the growth of the large, unstriped muscle fibres present, as well as the evolution of the embryonic muscle cells, especially those of the inner layers of the uterine walls, into the larger contractile variety. The muscle fibres present become ten times as long and five times as wide as they were originally. Luschka and some of the recent French authors (*Charpentier*), maintain that there is really an increase in the number of such fibres, which can be demonstrated at the middle of pregnancy. The interstitial tissue of the organ likewise becomes looser, so that the fibres can be more easily isolated. The peritoneum also participates in the growth of the uterus. The cervix receives more blood, and its tissues loosen and become softer, the lips somewhat thicker and rounder in primiparæ, while from the external to the internal os there is a gradual progressive softening of the entire cervical tissue. There are also very distinct changes in the vagina from the very first month. Its color becomes bluish or violet, like the colchicum blossom; the epithelium shows a velvety softening, and the mucous and muscular layers are swollen. Holst likens these changes of substance to a tenacious dough, or to the œdema of the lower extremities in pregnant women. The livid coloration deepens toward the upper part, and is most pronounced at the cervix. The external genitals and breasts change very little in the first weeks. In consequence of the increased congestion, the tubes and ovaries become more succulent, and the evolution of the ruptured follicle, from which the impregnated ovum was discharged, into the true corpus luteum begins to take place. Elevated folds are formed upon the inner surface of the fibrous tunic of the follicle, caused by wandering cells from the walls of the follicle; the epithelial cells proliferate and undergo fatty degeneration, and a sort of pseudo-vitelline substance is formed, which is absorbed by the delicate vessels of the young connective tissue. The true corpus luteum shows at first in its centre large, pigmented, granular cells, crystals of hæmatoidin and connective tissue; it is yellower, owing to the fatty degeneration of the cells, and also larger than the ordinary corpus luteum. It attains its full development in the second or third month, and then remains unchanged until the end of pregnancy. There are, however, cases where it is wanting or very slightly developed (*Spiegelberg*). As its growth progresses it approaches the centre of the ovary. Later on it shrivels up, owing to absorption of the fat of its cells, and gradually disappears or leaves an imperceptible scar, which sometimes contains crystals of hæmatoidin.

CHAPTER IV.

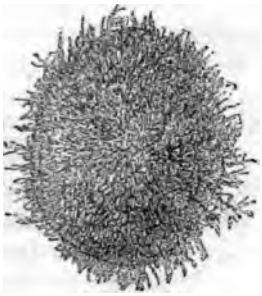
The Further Development of the Embryo and the Fœtal Membranes in Pregnancy.

LITERATURE.

Arnoljevic: "Das Alter, die Grössen und Gewichtsbestimmungen der Fötalorgane." München, J. D., 1884. E. Brandt: "Das Alter, die Grössen u. Gewichtsbestimmungen der Fötalorgane beim menschlichen Fötus." München, J.-D., 1886.

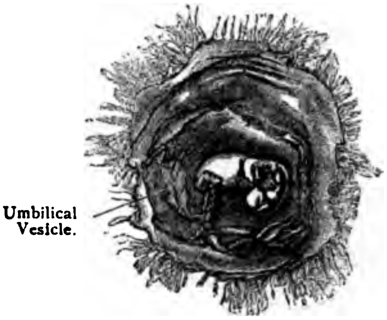
Between the *fifth and eighth week* the ovum is about as large as a hen's egg, being about 5 cm. long and 3½ to 4 cm. wide. The embryo grows from 8 to 9 mm. to 22 to 25 mm., weighs nearly 4 gm., the whole egg weighing from 22 to 25 gm. (Fig. 7).

FIG. 7.



Ovule. Last menstruation 7 weeks ago. Decidua removed. Frau Gl., 28 years; 3 miscarriages; 1 normal birth.

FIG. 8.



Ovum of 6 weeks, opened. Embryo, 12 mm. in length; umbilical vesicle, 6 mm. in length; umbilical cord, 5 mm. in length.

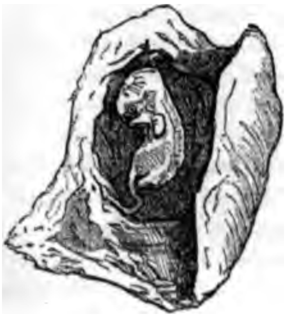
The embryonic head is twice the size of the trunk. The eyes are seen as dark specks, while the nose projects slightly. The upper arm, forearm, and hand can be distinguished upon the extremities.

The clavicles and lower jaw already show bone nuclei. The wide buccal fissure becomes gradually smaller (Fig. 9). "The transition from the embryo to the fœtus takes place when it has attained a length of from 13 to 16 mm., for after this stage has been reached the shape of the head and the articulations of the extremities have become definitively human. Hence the term fœtus is more appropriate at the end of the second month, as by this time the articulations have taken on a permanent character" (*His*). About this time the umbilical cord becomes somewhat longer, but still contains a portion of the intestine projecting into it; while of the allantois only the vasa umbilicalia remain. The umbilical vesicle is of considerable size, and the ductus omphalo-mesentericus still persists as a delicate filament. The amnion has approached the chorion, and the amount of amniotic fluid has increased (weight 15.3 gm.).

About the middle of the second month, the villi begin to develop more luxuriantly at a certain point upon the chorion, and this marks the formation of the placenta. The thickness of the uterine walls surrounding the ovum bring the uterus up to about the size of an apple at the end of the second month, and its anterior wall, when felt through the anterior vaginal fornix, is moderately firm to the touch.

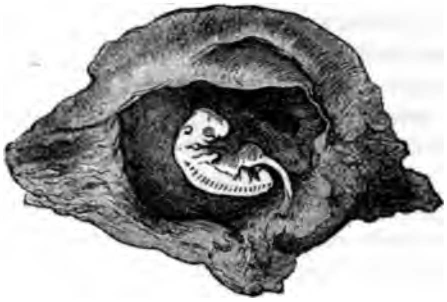
The os externum is succulent and more rounded, and is sometimes deeper in the pelvis than normal. Sometimes the fundus projects above the superior strait. At this period, the linea alba shows traces of pigmentation. The breasts are fuller, the areola and its sebaceous glands are somewhat swollen, and by moderate pressure a serum-like fluid may usually be expressed from one or both glands.

FIG. 9.



Embryo of 7 weeks.

FIG. 10.



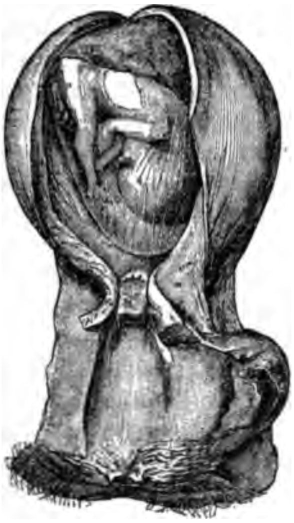
Embryo of 7 or 8 weeks, with a piece of the intestine still projecting into the umbilical cord.

THIRD MONTH.—From the ninth to the twelfth week the ovum is about the size of a goose egg, the fœtus measures 7 to 9 cm. in length, and weighs about 20 gm.; its head is only one-third the length of the body and more sharply differentiated from the trunk, the neck being also longer. The nasal and buccal cavities are separated by the palate. The skin begins to project in places, the lips form and the rudiments of the teeth develop. Labia majora or scrotum can be discerned; the penis and clitoris, however, are still of equal length. The ribs now form and differentiate the thorax from the abdomen. Fingers and toes are distinct, with rudimentary nails. Points of ossification have now appeared in almost all the bones. The pupillary membrane forms and the eyelids grow together. The intestine has withdrawn from the umbilical cord, which begins to become twisted and is now longer than the fœtus. The placenta at this time is already 5 to 8 cm. broad, and about 1 cm. thick; meanwhile the decidua vera and circumflexa have fused together, and the liquor amnii is more abundant. In several cases measured by myself, the length from head to caudal extremity at the end of the third month was 6.75 cm., to the sole of the foot 9 cm., the horizontal cephalic periphery 8 cm., vertical diameter of the head 3 cm., biparietal 2.3 cm., straight 2.6 cm., the long diagonal 3.1 cm., the short 2.7 cm. The umbilical cord was from 8 to 9.5 cm. long, and about as thick as a crow's quill. The placenta showed a diameter of 6.7 cm. by 1 cm. thick, and weighed 24.5 gm. The uterus is now about the size of a child's head, is broader, softer and almost doughy to the touch. Charpentier gives the diameter of the uterus as 7 cm. in length, breadth and thickness, but the figures of Farre and Tanner are probably more correct, viz.: 12–13.5 cm. in length, 11 in width, and 8 cm. in thickness. The fundus may rise above the symphysis at the end of the twelfth week; the softening of the cervix is more notable, so much so that the French authors (Charpentier) give an exact measurement (from 3 to 5 cm.).

According to my observations in the clinic of Munich (see dissertations of Arnoljevic and Brandt), together with the average figures furnished by other authors, the fœtus in the course of the FOURTH MONTH is from 12 to 17 (10–17) cm. long, and its weight increases from 43 to 117 (30–120) gm., while its brain weighs from 8.15 to 14.5, its liver 3.5 to 5.5 grams, and the circumference of the head measures 10 to 14 cm.; the sex is now apparent, lanugo formation begins, and slight movements are noticed. In children born at this time an attempt at respiration is made. The measurements of the head are as follows: 3.2, 3.7, 4.2, 4.9, 4.4 cm. (see page 53); fronto-occipital circumference, 13 cm. The large intestine contains a small quantity of grayish-white mucus. The umbilical cord is thicker, owing to the beginning of the formation of the jelly of Wharton, and is about 16 to 18 cm. long, with numerous spiral turns. The placenta is now complete, and is 7.5 to 8.5 cm. in diameter. At the end of the sixteenth week the uterus is about the size of an ostrich's egg, it projects above the symphysis, and is softer in some places; it is sometimes possible to move the fœtus about. The diameter given by Cazeaux, namely, 9½ cm. in all directions, is not so exact as those calculated by Farre and Tanner, viz.: length, 15 to 16 cm.; breadth, 13.5 cm.; thickness, 11 cm.

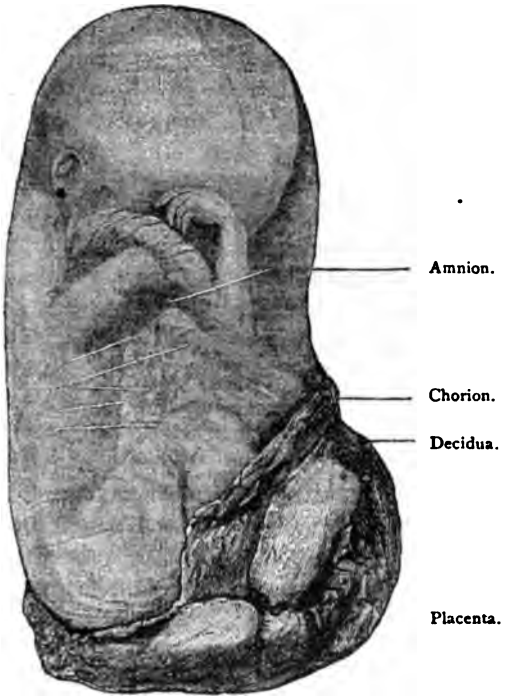
AT THE FIFTH MONTH the length of the fœtus increases from 20 to 26 (17–27) cm., and its weight varies from 139 to 350 (250–275) gm. The head measurements at the middle of the fifth month are 3.7, 4.1, 5.8, 6, 5.1 cm.; the horizontal, 13.0 to 17.0 cm.; the vertical, 15.5 cm. Weight of brain, 20 to 61 gm.; that of the liver, 18 to 19 gm.; fine lanugo is seen, especially on the head, as well as vernix caseosa; the eyelids begin to separate, and the nails are more solid. The contents of the small intestine are of a greenish color, owing to the commencing biliary secretion. The umbilical cord is 22 to 30 cm. long; its spiral turns are more numerous, with an increased amount of the jelly. The placental diameter is 11.8 by 1.5 in thickness; its weight 70 grams. The amniotic fluid exceeds the body in weight. The uterus has grown so that the diameters of the organ, according to Farre, are 16 to 19 cm. in length, 15 cm. in width, and 13.5 cm. thick (Fig. 11). Its position has also changed somewhat; it has turned slightly on its long axis, so that the anterior surface looks more forward and to the right, its left lateral wall being directed more anteriorly, while its cervical transverse diameter almost corresponds to the first diagonal diameter of the true pelvis. The uterine murmur may now often be heard upon auscultation, as well as the fœtal heart sounds at the end of this month. The mother also notices the child's movements at this time.

FIG. 11.



Uterus with fœtus of five months. Decidua reaching down into the cervix. Placenta left anteriorly, near the fundus; faulty position of fœtus. ½ : 1.

FIG. 12.



Fœtus at seventh month, born with amnion entire. Cord between the hands. ½ : 1.

SIXTH MONTH.—The fœtus is 28 to 34 (28–35) cm. long, and weighs 432 to 900 (700) grams. Its liver weighs 25 to 47 grams, the brain 70 to 118 gm.; circumference of the head, 19 to 24 cm.; its eyelids are now separated; panniculus adiposus is more abundant, the movements of the limbs are more energetic, while the muscles of the chest and gluteal regions are larger. The child born at this time cries a little. More meconium is found in the small intestine. The testicles are near the abdominal rings. The umbilical cord is inserted just under the middle of the abdomen. According to Farre and Tanner, the uterus at this time is 21.5–24 cm. long, 17.5 cm. wide and 16 cm. thick, which measurements agree closely with those of Cazeaux (22 : 16 : 16). The fundus is now within 4 cm. of the umbilicus, and the lower half of the umbilical fossa begins to get shallow; there is a more distinct pigmentation of the median line, and the softening of the cervix has passed beyond its middle portion. Until now the uterus has been of a globular shape, but from this point on, the long diameter begins to predominate and exercises a corresponding influence upon the position of the fœtus.

Seventh Month.—According to Hecker, the fœtus is from 35 to 38 cm. long at this time, while Spiegelberg and Ahlfeld give 34.8 and 38.3 cm. respectively. According to our own observations, the length is 35 to 38 cm., the weight 820 to 1155 grams; weight of brain, 115 to 152; of liver, 37 to 69 gm.; circumference of head, 23 to 28 cm. Hecker's weight is 1170 gm.; Spiegelberg's, 1069; Ahlfeld's, 1388. Subsequent to this time there is an increase per month of 3 to 5 cm. in length and 500 grams in weight. The skin, still wrinkled, is densely covered with hair, which is thickest on the forehead, cheeks and neck. The pupillary membrane begins to disappear, and is not present at the end of the month. The child, when born, cries with a wailing voice and usually dies in a few hours. (See Fig. 12.)

At the Eighth Month, the fœtus is 40 to 43 cm. long; circumference of head, 25 to 30 cm.; weight, 1360 to 1525 grams. According to our observations, it weighs 1335 to 1615 grams, of which 170 to 240 gm. represent the weight of the brain; 58 to 65 gm., that of the liver. The pupillary membrane has disappeared, the skin is poor in fat and very red; a fœtus born at this time may live if well cared for. The fundus uteri is now midway between the umbilicus and the epigastrium; pigmentation of the median line progresses accordingly. The child is usually in the vertical position, with the head downward.

At the Ninth Month, the fœtus is 46 to 48 cm. long, its head circumference increases from 31 to 34 cm.; its weight from 2188 to 2684 grams. (Brain, 280 to 382 gm.; liver, 97 to 130.) The skin becomes richer in fat and less red. The nasal and aural cartilages are hardly perceptible yet. The quantity of liq. amnii = 250 to 400 gm. The fundus uteri and pigmentation of the median line almost reach the epigastrium. The striæ attain their greatest extent, reaching beyond the umbilicus. The presenting part of the child is not so easily moved; the dilatation of the internal os often begins as early as the middle of this month in multiparæ, and in any case, at the end of the month. Beginning secretion of the breasts is shown by frequent moisture of the nipple, and the abdominal distention has now reached its highest degree.

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TENTH MONTH.—The fœtus is 48 to 50 cm. long, weighs 3100 to 3600 grams (brain 311 to 445 gm., liver 140 to 150), the skin is paler, richer in fat, with less lanugo; the finger nails do not as yet project beyond the tips of the fingers. Toward the end of the month the fœtus shows all the signs of complete maturity (see below). It is quite an interesting fact that the weight of the two kidneys always varies from the fourth to the eighth months, the left being somewhat heavier than the right, as shown by the following table:—

4th	month,	right	kidney,	0.27	to	1.3	gm.;	left,	0.25	to	0.45	gm.
5th	"	"	"	1.4	to	2.6	"	"	1.3	to	2.8	"
6th	"	"	"	2.6	to	7	"	"	3.8	to	6	"
7th	"	"	"	3.8	to	6	"	"	2.9	to	5.4	"
8th	"	"	"	6.8	to	8	"	"	7.5	to	7.6	"
9th	"	"	"	11.0	to	11.5	"	"	10.5	to	10.8	"
10th	"	"	"	19			"	"	17			"

This variation was less in the last two months. According to Arnoljevic the specific gravity of the different organs appeared to increase in a definite manner, corresponding to their growth; Brandt, however, does not confirm this regularity. According to observations made by the latter in my clinic, the specific gravities from the fourth to the tenth month were pretty constantly as follows: heart, 1.126, brain, 1.055, lungs, 1.087, stomach, 1.199, spleen, 1.118, kidneys, 1.147, liver, 1.112. The relative weights showed important differences, with the exception of the liver and brain, which varied from 1 : 11.5 to 1 : 27, and 1 : 6 to 1 : 8 gm. respectively as compared to the weight of the body. These figures, of course, will have to be confirmed and supplemented by other observations. The fundus of the uterus sinks again at the tenth month to the level originally occupied by it at the eighth month, the presenting part of the child dropping into the small pelvis and becoming gradually less movable. The internal os becomes more and more easy of access. At the end of the tenth month the whole uterus is 32 to 40 cm. long, 24 to 26 cm. wide and 17 to 20 cm. thick. Its walls are not equally thick at all points, being thickest at and near the fundus (1 cm.) and just above the internal os; at other points the thickness = about 0.5 cm. Its weight at the end of pregnancy is from 780 to 1200 gm., and its cavity has been widened 400 times its original size.

CHAPTER V.

The Fully Developed Child.

LITERATURE.

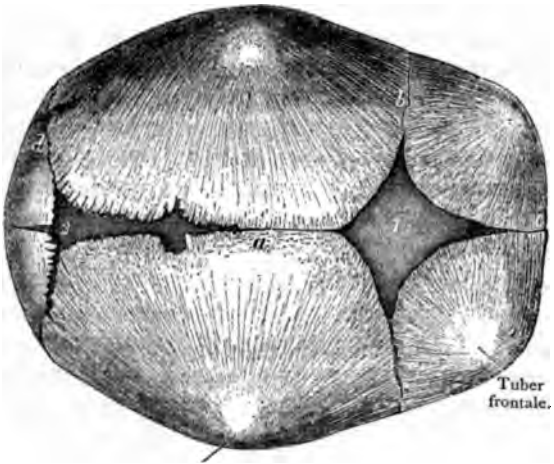
Issmer: *Archiv f. Gynäkol.*, xxx, 277, 1887. A. Martin: *Zeitschrift f. Gebh. und Gynäkol.*, 1887, I.

Of all the appearances which testify that the child has remained in the uterus until complete maturity, the length is the most constant and important; next in order come the weight of the child and the diameters of its head. The length varies from 48 to 54 cm., the average being 50 cm. The weight ranges from 2700 to 5400 ~~grams;~~ the latter figure, however, is very seldom reached. Of three thousand children born in Munich from 1884 to 1886, only 46 or 2.3 per cent. weighed 4000 grams or more, and none weighed over 5000 grams. The heaviest child of all was a girl 52.5 cm. long, whose weight was 4750 grams. A. Martin extracted a child which weighed 7470 grams without the brain and blood or about 8 kilograms untouched. The hair of the head is thick and about 3 to 4 cm. long, the sutures and fontanelles are narrow; the cartilages of the nose and ears are distinctly perceptible. The pupil is present. The living child at birth cries lustily and nurses vigorously. The skin is of a pale red color. Lanugo is seen only upon the neck, shoulders and back. Vernix caseosa is found in the axilla, folds of the thigh and back, and is often copious. The nails project beyond the tips of the fingers, while those of the toes reach as far as the end of the bed of the nail. The insertion of the umbilical cord is about 2½ to 3 cm. under the exact middle point of the body. The genitals are fully developed and contain the testicles in the male; in the female the labia majora cover the labia minora, so that the rima vulvæ is closed. The centre of ossification in the lower epiphysis of the femur is 5 mm. in size in the mature fœtus, but may attain to this at an earlier period, and may also be wanting or very little developed at birth (*Caspar*, *Béclard*, *Hecker*, *Hartmann*). The head of the child shows the following sutures (Fig. 13): 1. The frontal suture, extending from the root of the nose to the large fontanelle; 2. The coronal suture from the antero-lateral fontanelle on each side to the large fontanelle; 3. The sagittal suture between the large and small fontanelles; 4. The lambdoidal suture, between the occipital and parietal bones, running downward on each side to the postero-lateral fontanelles. Between these sutures, are four more or less large spaces, as follows:—

(1) The large fontanelle, four-cornered, diamond-shaped, the anterior angle of which is the most acute. This fontanelle is bounded by the frontal and parietal bones. (2) The small fontanelle, between the parietal and

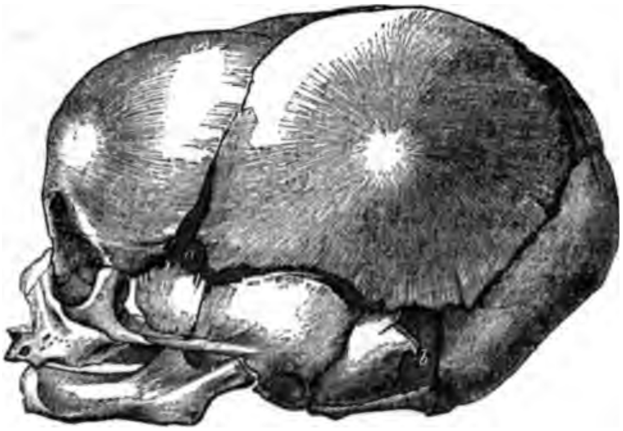
occipital bones; in mature children this is not a space but a shallow depression formed by the angle of junction of the lambdoidal sutures at the apex of the occipital bone (Fig. 13). (3) The two antero-lateral fontanelles between the frontal, temporal and sphenoid bones; these are square and form the lower ends of the coronal suture (Fig. 14). (4) The two postero-lateral fontanelles between the parietal, temporal and occipital bones; these are likewise square. The larger these sutures and fontanelles are, the greater

FIG. 13.



Skull, seen from above. 1. large fontanelle; 2. small fontanelle; *a*. sagittal suture; *b*. coronal suture; *c*. frontal suture; *d*. lambdoidal suture. Two-thirds natural size.

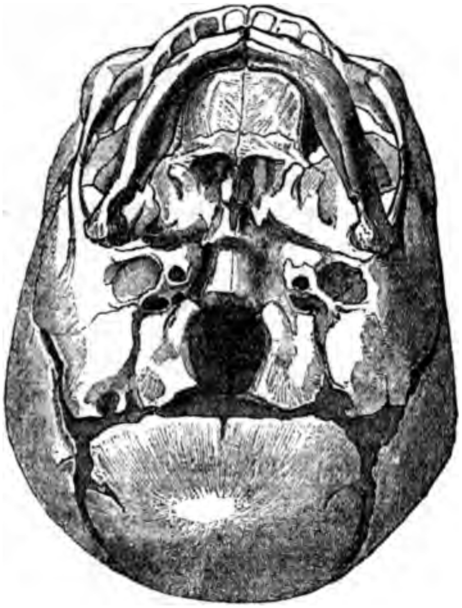
FIG. 14.



Lateral view. *a*. Antero-lateral fontanelle. *b*. Postero-lateral fontanelle. Two-thirds natural size.

is the degree of flexibility and compressibility possessed by the head (Figs. 14 and 15). The following cephalic diameters are distinguished upon the cranium, measured over the skin: 1. The short transverse or bi-temporal diameter, extending from one antero-lateral fontanelle to the other = 8 cm. 2. The long tranverse or bi-parietal diameter, between the two protuberances of the parietal bones = 9.25 cm. 3. The straight or occipito-frontal, extending from the glabella (root of the nose) to the point of greatest prominence of the occiput or crista occipitalis externa = 12 cm. 4. The long oblique or occipito-mental extending from the chin to the most distant point of the occiput = 13.5 cm. 5. The short oblique or sub-occipito bregmatic, from the region of the neck at a point corresponding with the posterior margin of the foramen magnum to the middle of the large fontanelle = 9.5 cm. 6. The perpendicular or vertical diameter from the vertex of the skull to its base = 9.5 cm.

FIG. 15.



Skull, from below. Gaping space between the glenoidal and squamous portions of the occipital bone. Two-thirds natural size.

The circumference from the forehead to the point of greatest curvature of the occiput or peripheria fronto-occipitalis measures 34 cm., while that carried from the large fontanelle around the angles of the jaw, the peripheria mento-frontalis = 32 cm.; that drawn from the nape of the neck around to the great fontanelle or peripheria occipito-bregmatica likewise measures 32 cm. The circumference corresponding to the long oblique (occipito-mental) diameter measures 36 cm. It is a general rule that the skull of the male is somewhat larger than that of the female infant.

CHAPTER VI.

The Umbilical Cord, Funis, Funiculus Umbilicalis.

LITERATURE.

Hyrtl: "Die Blutgefässe der menschl. Nachgeburt." Mit 20 Tafeln. Wien, 1870. Kehrer: *Archiv f. Gynäkol.*, II, 135. Neugebauer: "Morphologie der menschl. Nabelschnur." Breslau, 1858.

The umbilical cord is derived from the allantois with the umbilical vessels, the vitelline duct with its vessels, and the amnion, together with the gelatin of Wharton, which corresponds to subcutaneous connective tissue; it is complete as early as the first four weeks of pregnancy. Its sheath is formed by the amnion, and Wharton's jelly is merely a sort of embryonic connective tissue. Within the cord are, in the first place, the two umbilical arteries, 3 to 5 mm. in thickness, and characterized by very strong muscular walls; they very seldom show varicose distention, but are often thrown into tortuous lateral and spiral turns. In the neighborhood of the placenta a communicating branch is of almost constant occurrence. According to Hyrtl, in about 6 per cent. of all cases there exists but one umbilical artery; this happens more frequently in boys than in girls. Sometimes the two arteries merge into one trunk, near the placenta, but this is rare. The umbilical vein is larger, about 5.8 to 7.7 mm. thick, with thin walls and no valves; it usually winds around the arteries. It comes from the placenta and, sometimes dilating suddenly to a bulb 9 to 12 mm. in thickness (*Hyrtl*), passes on without branches, through the cord and umbilical ring, into the liver through its suspensory ligament. The ductus omphalo-mesentericus is found in the umbilical cord as an obliterated cord passing to the umbilical vesicle (see page 59). The length of the cord varies considerably from 0 to 200 cm. (Schäfer 10 mm., Neugebaur 163 cm.). Its average length in the mature child is somewhat longer (51 cm.) than in the fœtus. Upon the inner surface of the umbilical vessels are noticed crescentic or ring-like ridges, producing constrictions upon their outer surfaces; these are the valves of Hobokenius, named after their discoverer.

Wharton's jelly is composed of gelatinous layers of tissue, with an admixture of a more compact variety of connective tissue, partly sub-epithelial and partly disposed in bands between and around the vessels (chordæ tendineæ of Hyrtl), and evidently serves as a protection to the vessels. Hohl supposed it to have a less subordinate function, namely, that of nourishing the fœtus. Valentine, Schott, and Kölliker described nerves and lymphatics in it, but these were not found by Virchow. Recently Ruge claimed to have found nutritive vessels in the umbilical cord.

Umbilical cords which are poor in gelatin are called thin, while those which are rich in it are designated as fat cords. The cord itself shows a more or less pale or bluish color. Here and there are appendages in the shape of accumulations of Wharton's jelly, which are called nodi gelatinosi; where they contain a vascular loop, they receive the name of nodi varicosi. The umbilical vessels, furthermore, twist around an imaginary axis, accompanied by the amnion, making it appear as though the whole cord were composed of spiral turns, which vary in number from ¼ and ½ to 30 or 40. The direction of the spiral turns is usually from right to left, because the A. umbilicalis dextra is said to be larger than the left; in one-third of the cases, however, the cord is twisted to the right, and in rare cases has no turns at all. These spirals form gradually from the 2d to the 4th month of pregnancy, while the fœtus is freely movable in the amniotic fluid. The predominance of blood pressure in the umbilical vein over that in the arteries twists the cord and the embryo attached to it. Later on, the fœtus, owing to its growth and the relative decrease of the amniotic fluid, may not be able to follow the twisting of the cord by turning itself, and this leads sometimes to the formation of slings around some part of the fœtus, which occurs about once in five cases, or open loops may remain, and the fœtus passing through these, ties the cord in a true knot; this seldom happens during pregnancy, but occurs more often during labor, the loop being in advance of the head or breech, as the case may be. The formation of knots presupposes great mobility of the child, that is, an excess of amniotic fluid, or else a considerable length of the cord; for this reason these knots are usually quite loose, and are often seen slipping along the cord from the child to the mother, as the former is driven on through the genital canal. The thicker umbilical vein, being one-sixth longer than the arteries, has a centrifugal position.

The insertion of the cord into the placenta may be central, lateral or marginal; the lateral insertion, that is between the centre and the margin, obtaining in 65.5 per cent. of all cases, while the central is present in 20 per cent., and the marginal in 14.5 per cent. Where the umbilical vessels separate in the membranes before reaching the placenta, the condition is known as velamentous insertion. In such cases the cord may be inserted into that portion of the membranes most distant from the placenta, or even opposite to it. Hyrtl and I have found this of frequent occurrence in female children, as well as in twins, breech presentations and transverse positions. In 8660 births, I found this condition 65 times or in 0.57 per cent. (0.6–1 per cent. according to others). Very rarely the umbilical cord divides into several branches, which enter the placenta singly: insertio furcata. About 7 to 9 mm. from the abdomen, the amnion or sheath of the cord with its epithelium fuses with the epidermis, while the connective tissue is continuous with the cutis vera.

CHAPTER VII.

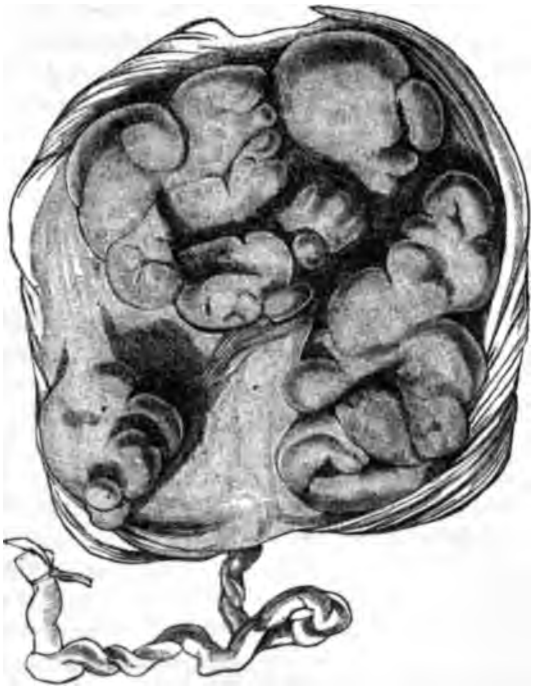
The Placenta.

LITERATURE.

Ahlfeld: "Berichte u. Arbeiten aus der Marburger Klinik." 1887. III Bd. Friedlaender: "Phys.-Anat. Untersuchungen." Leipzig, 1870. Gusserow: *Monatsschrift f. Geburtskunde*, XXVII, 90, 1866. Hennig: "Studien ueber den Bau der Placenta." Leipzig, 1872. Klob: "Path. Anat. der weiblich. Sexualorgane." Wien, 1864, p. 560. Küstner: "Tageblatt der Naturforscherversammlung in Magdeburg." 1884. Langhans: *Archiv f. Gynäk.*, I, 317, 1870. Leopold: *Archiv f. Gynäk.*, XI, 443, 1877. Ribemont-Dessaignes: "Des Placentas multiples dans les grossesses simples." Paris, 1887. Schultze, B. S.: *Jenaische Zeitschrift f. Medicin.* I, 2, 1864. Winkler: *Archiv f. Gynäkol.*, IV, 338, 1872.

The placenta is usually round or oval in form, but it may be kidney-shaped, like a figure-of-eight, or lobulated and divided into several portions—placenta biloba, triloba (Fig. 16)—each of which then receives an umbilical artery and gives off a vein, which joins with its fellows to form the umbilical vein. By placenta fenestrata is understood that condition in which an opening covered only by the membranes exists in the centre or side of the placenta. Two surfaces are distinguished upon the placenta—the uterine and the fœtal side. The former is arched, red, and provided with furrows, which separate the cotyledons from one another, and is covered over by the decidua vera (formerly called serotina and easily detached), the continuation of which upon the membranes may be easily raised up for about three cm. around the border. This part is the maternal

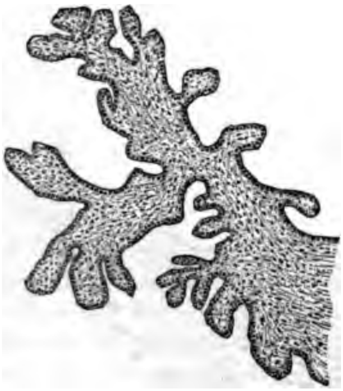
FIG. 16.



Placenta marginata bipartita succenturiata.—Poliklinik, 30, IV, 87. (One-third natural size.)

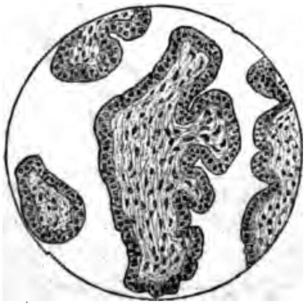
placenta; it consists of a layer rich in cells, and a spongy stroma under this, showing many distorted and enlarged gland spaces, with multinucleated giant cells extending into the intermuscular tissue of the uterus. The enlarged capillaries of the decidua lose their walls, only the endothelium remaining, and form large sinuses; from these the blood flows out partially by isolated veins and partially through the large marginal sinus which lies between the chorion and decidua, and thence gains the veins which pass through the muscular walls of the uterus. As early as the eighth month some of these veins are blocked by thrombi composed of large giant cells (*Friedländer, Leopold*). The fœtal portion of the placenta consists of villi with their vessels (Figs. 17 and 18). Only a portion of the former penetrate to the sinuses above mentioned, the shorter ones terminating in the superficial cellular strata. Those whose growth is continued as far as the open-meshed, glandular layer form the supporting framework, and the delicate gray membrane found between these, upon the outer surface of the placenta, is derived from the partitions of the ampullar layer.

FIG. 17.



Villi of the chorion (low power).

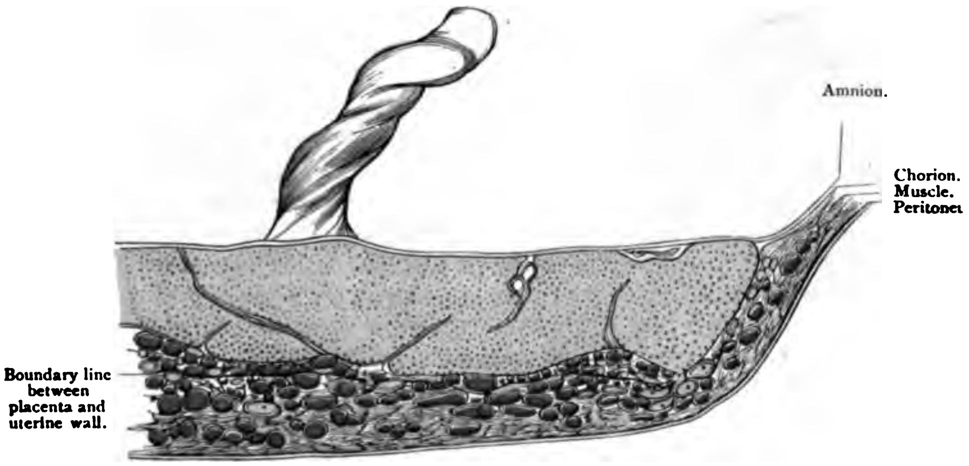
FIG. 18.



Villi (higher power). × 330.

The remaining villi press against the walls of the maternal vessels, and, according to Waldemeyer, the simple soft endothelial tubes, which are the continuation of the convoluted arteries, project into the lumen of these vessels, and are thus bathed in the maternal blood, although separated from it by the delicate endothelium. According to Hofmann, a considerable number of villi do not reach the maternal blood directly, but still are concerned in the vital processes going on between mother and child, inasmuch as the decidual cells between them yield up a secretion similar to the uterine milk in animals, which is taken up by the villi and their vessels. These fluids, found by Hofmann in the intervillous spaces, according to Werth, were probably produced after death, and his theory is therefore no longer tenable. The fœtal surface is flat and covered smoothly by the amnion, which projects somewhat, owing to the large underlying vessels. Immediately after birth the entire placenta may be injected through the umbilical vein with warm milk without losing a drop from the vessels, thus showing conclusively that not only do the fœtal vessels not communicate with those of the mother, but also that they are not even torn by the detachment of the placenta (*B. S. Schultze*). The same fact may be demonstrated upon the cadaver by injecting the uterine vessels on the one hand through the hypogastric arteries, and the placenta through the umbilical arteries, by means of different colored fluids (see Fig. 19). It is seen that the two fluids do not mix. It is thus possible to draw a distinct boundary line between the uterus and the placenta, as well as to show that in places the fœtal vascular system penetrates deeply into the uterine wall. It was formerly supposed that the placental site was at the fundus or over one of the tubal openings. (Fig. 11). This supposition is incorrect. The placenta is usually lodged upon one of the uterine walls, the anterior as often as the posterior (*Gusserow*, *Hennig*), with its lower border about 5 to 10 cm. distant from the region of the internal os, spreading out laterally or extending up to the fundus, which is not remarkable, as its diameter amounts to from 15 to 20 cm. at the end of pregnancy. The thickness in the middle is 3 cm., and from 0.5 to 1 cm. at the edges.

FIG. 19.



The placenta, adherent to the uterine wall, injected through the umbilical arteries, while the uterus is injected through the art. hypogastrica.

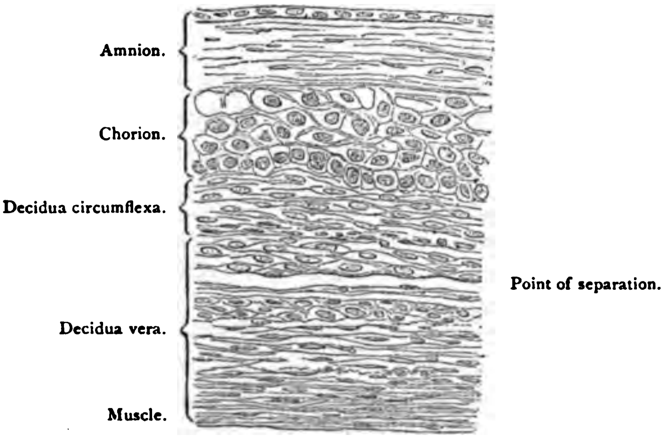
In those cases with a single child, where the placenta is divided into two halves connected by a small bridge of the membranes, we must suppose the ovum to have lodged at the junction of the anterior with the posterior wall, and that, owing to the distention of the uterus at this point, the portions of the placenta attached respectively to the anterior and posterior walls were torn apart, with subsequent atrophy of the villi because of their non-contact with the wall of the uterus. Ribemont-Desaignes has found this abnormity to be the general rule among the Makaces, Cercopitheces and Semnopitheces, and thinks it therefore to be a sign of retrogression to a lower type of organization (?). In 6701 births at the Maternité, he found it 19 times = 1 : 352 (see Fig. 16).

The weight of the placenta, according to Gassner, as compared with that of the child, is as 1 to 5.5. In 60 per cent. I found it weighed from 400 to 600, in 33 per cent. from 600 to 1000 grams. There is a constant relation between this weight and the development of the healthy child, for it is greater in heavy children. However, the placenta may be large and heavy even with a small, unhealthy child, as will be established below, under the head of infantile syphilis. The heaviest placenta found by me weighed 1360 grams. One of the most frequent physiological changes found in the placenta of mature children is the deposit of lime salts, which is easily recognized by the white color of the uterine surface and the roughness upon palpation. These deposits are sometimes superficial and scaly, while in other cases branching formations penetrate into the placental parenchyma. There is no trace of ossification to be found in this process, the deposits consisting of acid phosphates of lime and magnesia. Klob maintained that these concretions appeared in the ends of the villi, and that they were deposits due to the excessive production of lime salts in the fœtus. Of course they narrow or occlude the vessels, and thus lessen the fœtal respiratory surface. In most cases, however, the maternal tissues are also concerned in the process, and it is very rare that the fœtal tissue alone is implicated (*Winkler*, *Langhans*). In the macerated fœtus, Fränkel found the lime deposit only in the walls and lumen of the vessels of the villi. They are almost constantly found in cases of vigorous children, and in large quantities particularly when the children are very stout; still the placentæ are easily detached, so that we cannot consider them as of any importance in abnormal adherence of the placenta.

By *placenta succenturiata* is understood that condition in which there exist one or more small cotyledons which show placental structure, and are more or less distant from the edge of the placenta (see Fig. 16), but connected with it by intercurrent vessels. They are found in from one to two per cent. of all placentæ.

The umbilical vesicle and the remains of the vitelline duct are found usually between the membranes in the neighborhood of the insertion of the umbilical cord, or at least on the inner surface of the placenta between the amnion and chorion, in rarer cases, at some distance from the placenta. This vesicle is about the size of a pea, and is flat, of a yellowish or dull gray color, of jelly-like consistency with a white nucleus (sometimes quite calcified), and is connected with the cord by a very delicate filament, in which traces of blood-vessels sometimes still remain (*Schultze, Hecker, Ahlfeld, Ruge*). A falciform fold of the amnion (Schultze's fold) extending from the insertion of the cord will sometimes aid in finding this structure. In three per cent. of all cases there are noticed upon the fœtal surface in the chorion under the amnion, round, cyst-like prominences, varying from the size of a pea to a walnut, which are filled with a light turbid fluid, and are due to small extravasations of blood (see illustration in placenta prævia). In seven per cent. a so-called double border is found upon the fœtal surface, in the shape of a yellowish-white ring (about 1 to 1.5 cm. broad) surrounding the outer border concentrically, under the amnion. This is formed from fibrin and is lamellated. Küstner believes ***placenta marginata*** to be the result of a more rapid growth of the placenta as compared with that of the uterine wall. This difference may amount to an average of several weeks when reckoned according to time. Its cause is probably to be sought in alterations in the mucous membrane of the uterus. Schatz, on the other hand, believes that we have here to deal with an imperfectly developed placenta with a narrow or polypoid insertion, and that there is no incongruous development of the surface of the uterine wall and the corresponding portion of the placenta.

FIG. 20.



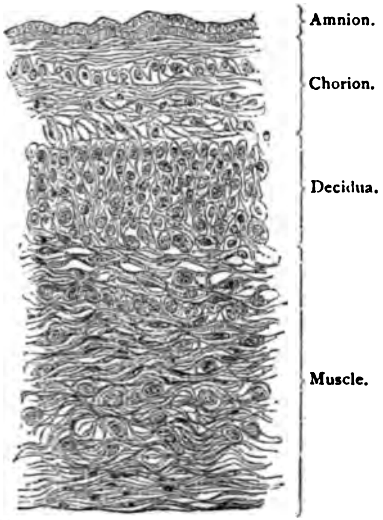
The Membranes. Section through the uterine wall during the last week of pregnancy. × 300.

Four layers of membranes may be distinguished from without inward upon the edge of the mature placenta (Fig. 20).

The decidua vera, a very thin connective-tissue membrane with large cells, and, in most cases, large, isolated nuclei. Very often, however, these nuclei are quite numerous (as many as sixteen). Fatty degeneration of the decidua vera begins as early as the middle of pregnancy, the vessels disappear and the separation occurs in the ampullary layer. As a rule, it is not entirely thrown off with the placenta, but escapes subsequently with the lochial discharge. Beneath the decidua vera, and firmly adherent to it, is found the decidua circumflexa, likewise in a state of fatty degeneration; its most constant constituents are bulky, elongated cells, with large, round nuclei, and turbid, granular contents. After the circumflexa comes the chorion, formed by a villous proliferation of the zona pellucida (Fig. 21). Toward the fœtus it consists of a strong connective-tissue framework with large, oblong cells, while externally are seen four to ten superimposed layers of round cells with central nuclei and turbid contents.

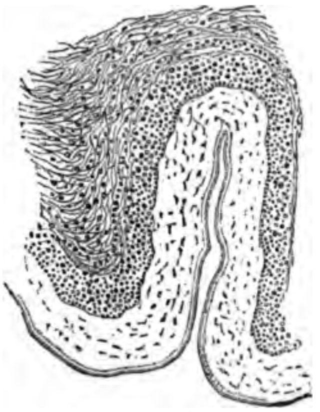
Those villi which have not contributed to the formation of the placenta, subsequently atrophy and become very delicate threads which serve to connect the chorion and the circumflexa. The chorion *per se* has no vessels or nerves. The villi grow solely at the point where the vessels of the allantois pass into them to penetrate with these structures into the decidua; here they multiply enormously, each villus containing a capillary loop and continuing to bud constantly. The innermost membrane or amnion is at first separated from the chorion by a clear fluid, but adhesion takes place between the two membranes as early as the third month, owing to the increase of liquor amnii. The amnion is formed by the protrusion of folds of the epiblast, which covers the somatopleure, arching over the embryo.

FIG. 21.



Membranes adherent to the uterine wall. × 330. Sperling; died April 12th, 1887. Air embolus.

FIG. 22.



The membranes upon the wall of the uterus. Diagrammatic. × 83.3. Puerperal woman. Sperling; died April 12th, 1887. Air embolus.

From the somatopleure is formed the epithelium of the amnion (Figs. 20–

22), a simple layer of polygonal cells; from the epiblast, the thin layer of connective tissue, which blends imperceptibly with the gelatin of Wharton. Leopold, Levison and Bar have found a lacunar lymphatic system in the amnion, from which fluids may pass to the surface by intercellular spaces in the epithelium. Meola found a single layer of epithelium upon the fœtal surface of the amnion (but no stomata), and the connective-tissue layer consisting of two strata, the innermost of which represents a transitional form between connective tissue and epithelium, while the outer contains unstriped muscle fibres and blood-vessels. (This can very seldom be demonstrated in the mature ovum.) The boundary layer between the amnion and the chorion, derived from the allantois, is called the membrana limitans by Meola. Viti found no vessels, but confirmed the existence of the four layers of the amnion (*Centralbl. für Gynäk.*, 1885–86). The amnion is delicate, thin and transparent. In mammals, such as the cow, pig and sheep, epithelial villi, derived from the epithelium of the amnion, form upon the umbilical cord, membranes and placenta, which are thrown off and swallowed by the fœtus (*H. Müller*, *Dreyer*, *Birnbaum*).

CHAPTER VIII.

The Liquor Amnii.

LITERATURE.

Baumm: *Münchener Med. Wochenschrift*, 1887. Dohrn: *Monatsschrift f. Gebk.*, XXVI, 114. Eichstedt: "Zeugung," u. s. w., p. 55. Fehling: "Das Dasein vor der Geburt.," 1887, und *Centralbl. für Gynäk.*, 1886, p. 412. Gassner: *Monatsschrift f. Geburtsk.*, XIX, 46. Hecker: *Klinik für Geburtskunde*, II, 226. Hegar: *Monatsschrift f. Gebk.*, XXII, 301, 448, and XXIX, 1–10.

The embryo and fœtus are surrounded by a fluid, the quantity of which gradually rises from 1 to 1500 grams, and amounts on an average to 1.87 kilograms at the time of maturity of the child, according to Gassner (113 cases), while my own observations of 60 cases show an average of 1300; Fehling, on the contrary, finds it to be only 600 grams (its quantity is greater in pluriparæ and heavy children, face and pelvic presentations and transverse positions) (*Baumm*). In pathological cases this may be increased to 10 kilograms. Its specific gravity varies from 1.002 to 1.015. At the beginning of pregnancy it is quite transparent, but becomes turbid later on, from the admixture with hairs, epidermic scales and vernix caseosa. At first the quantity seems to be greater than the weight of the fœtus:—

Weight of ovum, 1st month, 0.8 gm.; liq. amnii, 0.42 gm.
" " 2d " 22.06 " " " 15.3 "

Afterward it decreases relatively, although Gassner's investigations show a permanent and absolute increase until the end of pregnancy. The quantity of solid ingredients amounts to from 1.0 to 1.3 per cent., and it contains 2 to 4 per cent. of albumin and salts (phosphate, sulphate and carbonate of sodium, phosphate of lime, and a trace of potassium). In the case of a pregnant woman who had hanged herself, I was able to estimate the liquor amnii exactly; it weighed 1500 gm., had a neutral reaction and specific gravity 1.0109; it contained 0.097 per cent. of albumin, 0.05 per cent. of urea, 2.3 per cent. of dry substance, 1.03 per cent. of residue after incineration, in which Cl, Na, PO_5, SO_3, Ka (trace), Ca_2 (traces) and CO_2 predominated. The amount of sulphuric acid in the fluid = 0.005 per cent., and after incineration 0.027 per cent. SO_3; carbonates were not present. (Analysis by Dr. Weidner-Rostock.) It was formerly doubted that urea was a constant ingredient toward the end of pregnancy. Scherer, in spite of repeated examinations, failed to find it, although Rees and Wöhler were successful in this respect. The following were the results of my observations in the summer of 1867:—

1. The liquor amnii of a second twin, slightly alkaline in reaction, contained urea, 0.104 per cent, and albumin, 0.24 per cent.; specific gravity, 1.0067.

2. In another case the amniotic fluid showed a specific gravity of 1.0086, and contained urea, 0.086 per cent.; albumin, 0.22 per cent. gm.

3. In another case the cord was wound around the fœtus four times: here the specific gravity was 1.0036 and the quantity of urea 0.42 per cent.

It has been proven long ago that the fœtus secretes urine. Prout examined the fœtal urine (*Virchow*). According to Dohrn one finds in the bladder of the newborn child an average of 7.5 c.cm. of pale (often almost as clear as water) urine, which shows no albumin, is of specific gravity 1001.8 to 1006, and contains urea, uric acid and triple phosphates. The quantity of urea in the amniotic fluid of the early months is no greater than that of the maternal blood, which according to Picard contains 0.016 per cent., and according to Fehling 0.021 per cent., of urea; toward the end, however, it increases (*Gusserow*, *Picard*). The quantities noted by me in the above four cases, however, are by no means insignificant. Cohnstein and Zuntz were of the opinion that the conditions of pressure existing in the fœtal kidney were not in favor of a strong, regular secretion, basing their opinion upon direct calculation of the pressure in the fœtal vessels. In cases where the activity of the maternal kidney was limited for some reason or other during pregnancy, the damming up in the maternal blood of the excretions might be followed by a corresponding increase in their quantity in the fœtus and thereby lead to increased activity of the fœtal kidneys. As the fœtus approaches maturity the arterial pressure increases, and at the end of pregnancy it is possible that urine may be secreted, even if the quantity of the necessary ingredients in the fœtus be no greater than that contained in the maternal blood. In view of the great differences of opinion with reference to the quantity of urea in the liquor amnii, as mentioned above, we are justified in supposing that the discharge of the urine, like that of the meconium, into the amniotic fluid only takes place when, for some reason or other, the child is in danger; and that, on the other hand, the small quantities of urea constantly found in the liquor amnii are derived from the maternal blood.

The functions of the liquor amnii may be summed up as follows: it facilitates the free motion of the child, prevents compression of the umbilical cord, placenta and fœtal parts, and obviates adhesion of the latter to each other and the amnion. Furthermore, the movements of the child are modified to the mother's advantage, and any mechanical injury to the abdomen is lessened in violence as far as the child is concerned. In addition to this, during labor, it dilates the cervical canal, by means of the membranes, protects the child and its appendages from excessive pressure, keeps the placenta in its place upon the uterine walls, and tends to lubricate the parts. There has been much contention as to whether the amniotic fluid contributes to the nourishment of the fœtus, and this was considered all the more probable because fine hairs and liquor amnii were found in the fœtal stomach. The gradual increase of albuminous ingredients from 0.6 to 5.2 per cent. was also cited in support of this theory. It seems to me beyond question that the amniotic fluid, owing to its close resemblance to the blood serum, may convey nourishment to the fœtus in the first months, through the skin, just as protracted baths may nourish the adult, but in the latter half of pregnancy this influence must be very slight, if it be present at all.

The sources of the liquor amnii are not easily ascertained. It has been positively proven that at first it is transuded from the maternal vessels, the coloring matter of the blood having been demonstrated in the spaces between the chorion and amnion, and in the epithelium of the amnion; furthermore, it has been shown that considerable quantities of fluid may collect between the decidua vera and circumflexa (hydrorrhœa uteri gravidi), likewise between the circumflexa and the chorion, and the chorion and the amnion. More recently, however, Krukenberg has demonstrated that most of the amniotic fluid is derived from the maternal blood even at the end of pregnancy, and Haidlen has since confirmed this observation. Krukenberg, for instance, verified without exception the presence of iodide of potassium, given by the mouth at the end of pregnancy, in the liquor amnii, before the rupture of the membranes. This experiment was likewise invariably successful in pregnant rabbits, after subcutaneous injection of ½ gram of iodide of potassium, the animals having been killed one hour and a half later. Very little or none of the substance was found in the kidney of the fœtus. At an early period of pregnancy, about the end of the sixth month, no trace was found of the potassium iodide, except in very few cases. Krukenberg does not believe that substances may pass from the umbilical cord into the liquor amnii. Haidlen and Fehling found that the quantity of the amniotic fluid bore no relation to the weight and age of the child, any more than to that of the placenta or the length and spirals of the cord. As its quantity increases, the specific gravity does not fall nor does the percentage of solids decrease. More than this, Haidlen reports that the iodine test was successful after ingestion of iodide of potassium by the parturient woman, though the child was macerated; furthermore, he always succeeded in demonstrating *a large amount of iodine in the fœtal urine*, so that the drug may have been communicated to the liquor amnii by the latter, as well as by the placenta or umbilical cord. Numerous experiments show that, during the later months of pregnancy, iodide of potassium and other drugs return into the maternal system from the amniotic fluid, and may be thus entirely removed from the body.

In occlusion of the fœtal urinary passages and marked vesical distention, little or no liquor amnii was found (*Gusserow*), but it is not always lacking in such cases, and its absence, therefore, is no more to be interpreted as a proof that it is solely a product of the kidney than its presence in extra-uterine pregnancy demonstrates its derivation from the fœtus alone, for considerable quantities of serum may be poured into the fœtal sac from the membranes of an extra-uterine ovum, that is to say, from the peritoneal layer with its newly formed vessels. The truth of the matter, as usual, probably lies between the two extremes; that is, the skin and kidneys of the fœtus, the placenta and umbilical cord undoubtedly contribute to the liquor amnii; although without doubt it is principally derived from the maternal blood-vessels.

CHAPTER IX.

The Nutrition and Metabolism of the Embryo and Fœtus.

LITERATURE.

Cohnstein and **Zuntz**: *Pflüger's Archiv*, Bd. XXXIV, 1884. Dohrn: *Monatsschrift f. Gebk.*, XXIX, 105. Haidlen: *Archiv f. Gynäkologie*, Bd. XXV, 40. Jungbluth: "Das Fruchtwasser u. seine uebermässige Vermehrung." Krukenberg: *Archiv für Gynäkol.*, Bd. XXVI, 258. Viti: *Centralblatt für Gynäkol.*, 1886, 57.

As long as the embryo possesses no vessels or circulation, it is nourished by the vitellus and by osmosis from the decidua vera and circumflexa in its neighborhood, by means of the villi surrounding the ovum upon all sides, which readily allow fluids to pass through them. The decidua vera, in particular, by reason of its increased cell formation, would seem to be a sort of blood-forming organ for the embryo. As soon as the vasa omphalomesenterica develop, they convey the remains of the contents of the umbilical vesicle to the embryo to be used as nutritive material. After the formation of the placenta, the nourishment of the fœtus is maintained partly by direct interchange of gases and fluids between the maternal and fœtal blood at the points where the villi project into the blood of the mother, and perhaps partly in an indirect manner by the passage of the products of secretion of the decidua and its glands into the villi which do not penetrate to the maternal blood. The observations of Gusserow, Krukenberg and Haidlen have shown that substances dissolved in the maternal blood pass over into the blood of the child. Benicke and Fehling have likewise demonstrated the presence of salicylic acid in the child's blood after the drug had been administered to the mother. The passage of gaseous bodies from the maternal to the fœtal blood was proven by Zweifel in the case of chloroform, by Fehling in the case of carbonic oxide, and, finally, by Mars and others in the case of solid ingredients. Zweifel showed by means of spectrum analysis that oxygen is also transmitted by the placenta, as oxy-hæmoglobin bands were found in the blood of the umbilical cord. After the fœtal blood has been greatly regenerated in the placenta by the maternal blood, it passes through the umbilical vein and is distributed partly to the portal circulation, and partly by direct communication, through the ductus venosus, to the vena cava inferior, and from thence through the right auricle and ventricle to the pulmonary artery and aorta. At first, by reason of the smallness of the liver and lower part of the body, this blood is almost purely arterial. Below the opening of the ductus arteriosus Botalli, which carries the blood from the right ventricle and the pulmonary artery into the aorta, it is purely venous. Later on, the blood from the umbilical vein becomes more mixed and venous in the vena cava inferior, right auricle and aorta, owing to the growth of the child's organs. With the first respiration, owing to the expansion of the lungs, the blood of the right ventricle is driven into the pulmonary artery alone, and the oxygenized blood streams from the lungs into the left auricle in considerable quantity. The blood pressure, increased in the left auricle in this manner, closes the valve of the foramen ovale, while the pressure in the right heart is diminished by the opening of this new and important outlet (the lungs); the ductus Botalli lessens in calibre, its walls contract and, finally, the inner surfaces grow together. This lessens the pressure in the descending aorta, and hence the umbilical arteries undergo thrombosis, convey no more blood to the cord and placenta, and subsequently the umbilical vein becomes gradually narrowed and closes.

The temperature of the dead fœtus is the same as that of the mother, the living child, however, adds to this the heat produced by the work of the heart, muscles, and vital processes, and hence its temperature is about 1° F.

higher than that of the mother, as directly proven by Wurster and Alexis in breech cases.

In my clinic in Dresden, Sommer found the average rectal temperature of the mother only about 0.39 lower than that of the new-born child; the greatest difference in favor of the child was 1.26, in favor of the mother 1.07. In 80 per cent. the child is warmer, in 7 per cent. the same temperature, and in 14 cases colder than the mother. The temperature of the vagina and uterus sinks with the death of the fœtus (*Schroeder, Cohnstein, Archiv*, IV, 1872). When pregnancy and labor run their normal course, the meconium is not discharged into the amniotic fluid, giving evidence of a very slight peristalsis. The meconium is of deep dark-green color, and is composed of mucus and intestinal epithelium, bile, biliary pigments, cholesterin, crystals of hæmatoidin, and, finally, epidermic cells and lanugo. The quality of the blood of the fœtus in the first months of pregnancy is worthy of attention, owing to the insignificant number and slow growth of the red blood corpuscles. The quantity of blood varies considerably, more being at first present in the placenta, then later on an equal quantity in each, and finally, more in the fœtus than in the placenta. The arterial blood pressure in the fœtus is hardly half as great as in the child immediately after birth; the venous blood pressure, on the contrary, is much higher. The current in the umbilical arteries is said to be much slower than in vessels of similar calibre in the adult (*Cohnstein* and *Zuntz*). The quantity of oxygen used by the fœtus is four times less than the maternal consumption, while the amount of carbon dioxide eliminated according to volume is about as great as the amount of oxygen received. The change in the quantity of gases which the fœtal blood undergoes in the placenta is about half as great as that which goes on in the lung during respiration. This explains, upon the one hand, the slight metabolism of the fœtus, and upon the other the possibility of a longer survival after cutting off this connection, instead of immediate suffocation, and finally, the slight difference between the temperature of mother and child.

CHAPTER X.

Further Changes in the Uterus and the other Genital Organs.

LITERATURE.

Bayer, H.: "Morphologie der Gebärmutter." Gynäk. Klinik von W. A. Freund: Strassburg, 1885, p. 369. Ruge: *Zeitschrift f. Geburtsh. und Gynäk.*, Bd. V, p. 149. Virchow: *Monatsschrift f. Geburtsk.*, X, 242. Roederer: "Elementa artis obstetr." Götting., 1758, § 59. Hennig: *Monatsschrift f. Geburtshülfe*, XXIV, 437. Holst: "Beiträge zur Geburtshülfe." Heft I, 130. Spiegelberg; "De cervicis uteri in graviditate mutationibus." Regiomonti, 1885. Küstner: *Archiv f. pathol. Anatomie*, 1876, Bd. LXVII, 214. Bayer: *Centralbl. f. Gynäk.*, 1886, Nr. 18, p. 273. Waldeyer: "Medianschnitt einer Hochschwangeren bei Steisslage des Fötus." Bonn, 1886. Felsenreich und Krause: *Anzeiger d. k. k. Gesellschaft der Aerzte in Wien*, 1879, Nr. 28. Schlee: *Zeitschrift für Geburtsh. und Gynäk.*, Bd. XIII. Credé: *Monatsschrift f. Geburtskunde*, 1859, Bd. XIV, 321, und Hecker: Klinik I, 13. Schultze: *Jenaische Zeitschrift für Medicin*, 1868, IV, 577. Langer: *Anzeiger der k. k. Gesellschaft der Aerzte in Wien*, 1879, Nr. 28. Lahs: "Was heisst unteres Uterinsegment?" *Archiv für Gynäk.*, XXIII, 215.

The growth of the uterus in the first half of pregnancy is an active growth, while that of the second half is rather a distention due to the pressure of the growing fœtus. The muscular wall may be divided into an external, an internal and a middle layer, the latter of which becomes most hypertrophied of all, and it is here that the most numerous, thickest and largest vessels, veins and sinuses are found. The internal layer contains more of the circular fibres at the internal os and orifices of the tubes. The outer layer maintains the connection between the uterus and its neighboring appendages, the round, broad and utero-sacral ligaments which serve to hold it in place. According to Ruge-Keuler, the muscle fibres are arranged like the tiles of a roof. The fibres begin at the peritoneum and run parallel to each other, diagonally through the uterine wall downward and inward, intersected by transverse fibres, whose meshes are narrow at the fundus, but grow wider as the os uteri is approached. According to H. Bayer, muscle fibres pass from the tubes and ovarian ligaments to the cornua, those on the posterior surface coming principally from the ligamentum ovarii, while those on the anterior surface are derived from the round ligament. The longitudinal superficial fibres of the tubes, together with those of the round ligaments, form a sort of cone-like covering at the fundus, which passes from left to right on the right side and *vice versâ* on the left side. The innermost layer of the uterus is a continuation of the inner muscular layers of the Fallopian tubes. The middle layer receives off-shoots from the middle or circular layer of the tubes, the round ligaments and the ovarian ligaments, and the intersecting fibres are thrown around the angles of the uterus in spirals and oblique rings. A triangular muscle is formed upon the posterior wall by the external and internal longitudinal fibres of the tubes, to which are added the intersecting bands of the tubal circular fibres, the diagonally entering fibres of the ovarian ligaments, and eccentric rings and loops from the sacro-uterine bands which pass through all the layers. The fibres of the middle part of the anterior uterine wall are longitudinal and are derived from the external layers of the tubes and round ligaments. Middle layers come from the circular fibres of the tubes and from those fibres of the utero-sacral ligaments which join the latter anteriorly. Internally, a longitudinal layer is found which is continuous with the inner longitudinal fibres of the tubes. The arteria uterina hypogastrica during pregnancy becomes twice its former size (4 mm.), and it as well as the a. u. aortica are extremely convoluted, like corkscrews. The muscular fibres of the veins of the uterine plexuses (which are scantily provided with valves) are very much hypertrophied and have an important connection with the movements of the blood current. The spermatic veins on both sides become much larger than the hypogastric veins and are without valves, or, at least, with only indications of them. Of course, the uterine vessels are developed to a greater extent at the site of the placenta, and the veins at this point become very thick and anastomose frequently. The convoluted arteries lie upon these, and in isolated cases sink directly down into them, thereby slowing the blood current. The lymphatics of the gravid uterus are also considerably hypertrophied. The nerves are likewise developed to a greater extent by the addition of connective tissue; the nerve elements, however, are unchanged.

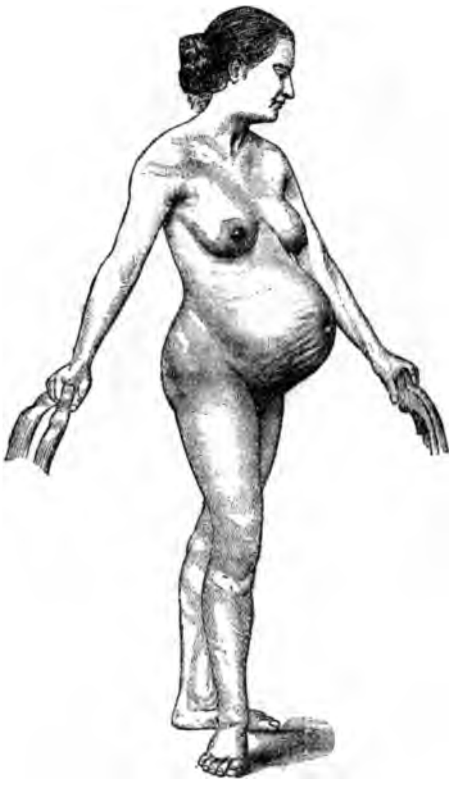
The peritoneal covering of the uterus becomes stronger and grows with it, while the broad ligaments become shorter as the uterus gets larger, so that the tubes and ovaries lie very close to the lateral walls of the uterus at the end of pregnancy. The round ligaments increase to cords about the size of one's finger; the left round ligament is often easily felt through the abdominal walls owing to the turning of the uterus upon its axis, and is sometimes seen through the anterior abdominal walls at the commencement of the pains. The principal increase is due to hypertrophy of their unstriped muscular fibres, but probably the bundles of striped fibres at the external inguinal canal are also enlarged. The changes in the form of the uterus in the course of pregnancy are as follows: The originally flattened pear-shaped organ becomes almost round like a cannon ball, to which the cervix is attached like a pedicle; later on, in the course of the sixth to seventh month, the round ball gradually becomes egg-shaped, the posterior wall being somewhat flattened by the spinal column. There has been much discussion recently as to whether the length of the cervical canal is affected by the growth of the ovum. This view was formerly asserted by Roederer and has lately been advocated by Bandl. It is in general not the case. Stoltz (1826), Spiegelberg (1865), Duncan, Lott and Peter have proved by direct measurements of the cervix during pregnancy and on the cadaver, that it remains unaffected until the last momen , that primiparæ and multiparæ are alike in this respect, that the apparent shortening of the portio vaginalis in the former is only the result of the hypertrophy of the vagina, and that this portion is sometimes so dislocated as to form an angle posteriorly with the axis of the uterus. When, however, Bandl found a ring above the so-called internal os, in pregnant women and during the puerperal state, and proved this to be the lower boundary of the thick muscle of the uterus, he maintained that the cylindrical epithelium of the cervical mucous membrane began directly under this ring, and it seemed as though the old theory of Stein and Roederer concerning the partial obliteration of the cervix by the growth of the ovum had gained the victory, as all authors conceded that the ovum filled up this segment of the uterus during pregnancy.

However, it was soon demonstrated by the microscope that completely developed decidua vera was also found in this zone, that the cylindrical epithelium does not begin until the internal os is reached, and that the portion in question is only that part of the uterus, thinned by the processes of pregnancy and the retraction of the uterine muscles, which we call the *lower uterine segment;* furthermore, that in vesicular moles the zone in question is not present, and that the upper boundary, called the "*contraction ring*" by K. Schroeder, corresponds to the internal os in the puerperal state. Some authors, among them Lahs, designate as the lower uterine segment all that portion of the uterus lying between the "contraction ring" and the external os. Küstner also found an hypertrophy of the cervical mucous membrane "which reaches down as cervical decidua for perhaps the fraction of a centimeter," and held that it was possible that this was utilized by the growing ovum. Overlach also (*loc. cit.*) emphasized the formation of decidual cells in the mucous membrane of the cervix. H. Bayer, who likewise believes in the utilization of the upper part of the cervical cavity for the reception of the lower end of the ovum, thinks this has been proven, and even goes so far as to claim that the lower uterine segment is an expansion of the supra-vaginal portion of the cervix, basing his opinion upon the anatomical relations in placenta prævia, in which he never was able to find the placental site below a distinct "contraction ring" in that zone of the uterus recognizable as the lower uterine segment by its physiological behavior.

It seems to me, therefore, not unworthy of mention, that in 1885, in a case of extra-uterine pregnancy, I myself saw a decidua vera thrown off which corresponded exactly in size to the size of the whole uterus and showed a constriction at the region of the internal os, so that it was shaped like an hour-glass. Occurrences of this kind are exceptions, without doubt, and I think the question may be regarded as settled in the negative, especially as Waldeyer's sections show the cervix quite intact, though the ovum was almost mature, and almost one-third of H. Bayer's cases (7 in 20) of placenta prævia were unattended by hemorrhage or dilatation of the cervix. The changes in the cervical wall are insignificant; its muscular tissue is unchanged. The mucous membrane of the *vagina* hypertrophies, the submucous fat decreases; the muscular tissue becomes stronger, and the organ is longer and more distensible. The *external genitals* seem swollen, with lividity of the internal surface of the labia minora. Their outer surface is often pigmented, and marked varicosities are frequently found, especially at the mons veneris, between the labia majora and minora, and around the clitoris.

The *tubes and ovaries* take part in the general hypertrophy, and are so situated that after the middle of pregnancy they are drawn up into the false pelvis. The presence of a single true corpus luteum in women who have died during the puerperal state, proves conclusively *that ovulation is usually suspended during pregnancy.* It might continue exceptionally, as is shown by cases of double uterus, in which both sides were impregnated and in which menstruation was reëstablished on one side after expulsion of the fœtus, while the other half was still in the gravid state (*Scanzoni*). This fact is confirmed also by observations of several corpora lutea after the birth of a child, and finally by returning menstruation after expulsion of the decidua in extra-uterine pregnancy. The changes in the *abdomen* and *umbilicus* are not visible until the fourth month. The anterior abdominal wall becomes more arched, with greater tension of the skin, and the recti muscles begin to separate from each other; this latter does not occur until the second half of pregnancy. The tension of the skin leads to the formation of *reddish stripes*, *striæ gravidarum*, beginning at the mons veneris; these are not due to tearing of the cutis vera and rete Malpighii as was formerly believed, but to a dragging which destroys the elasticity of the parts.

FIG. 23.

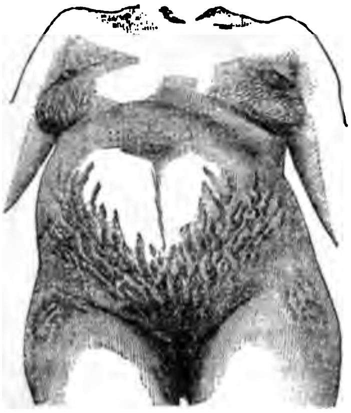


Gravida at tenth month. Striæ reaching above the navel. Normal abdominal curvature.

Parallel and oblique bands of fibres run toward the navel as a result of the shifting of the fibrous fasciculi (*Felsenreich, Krause, Küstner, Langer*); M. Scheele, however, has recently demonstrated tears in the pars reticularis and papillaris cutis, on sections of the hydropic cicatricial skin of a pregnant woman, in the most striking manner.

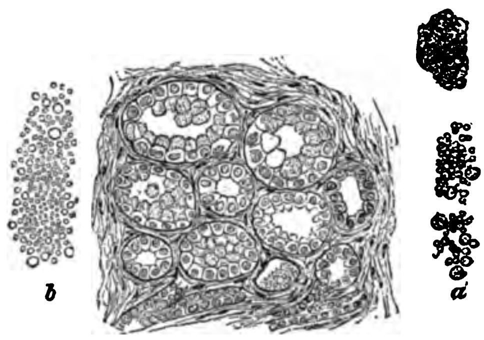
The decreased abdominal sensibility which prevails during pregnancy is most marked at these striæ. The striæ are composed of small, short lines, which begin below and internally and form an arch which extends above the navel; in exceptional cases they run at right angles to the median line, and they sometimes pass down from the skin of the abdomen to the nates and upper third of the thigh. They are sometimes pigmented and often project above the abdominal surface, owing to slight œdematous infiltration.

Fig. 24.



Striæ upon the abdomen, thighs and breasts. Secondary areola.

Fig. 25.



Breast during lactation. *a*. colostrum. *b*. milk. × 330.

Later on they become paler, and after the uterus is emptied the skin folds over at these points in small transverse lines. Quite frequently the recent, reddish striæ and the old, wrinkled ones are seen together upon the same abdomen. In 6 to 10 per cent. they are entirely lacking, or there may be none with the first pregnancy, their appearance being delayed until a second confinement. B. S. Schultze found them upon the thighs of women who had never borne children in 36 per cent., and in 6 per cent. of men. The *linea alba* is distended by each pregnancy, and it remains 2 to 3 cm. wider in women who have had children (*M. Schlee*).

The breasts become hyperæmic at the commencement of pregnancy and increase in size, the glandular lobules beginning to develop at the commencement of the second month, and numerous distended ones can be faintly seen through the integument of the breast. The nipple also grows and its areola becomes rose-red in blondes and brownish-red in brunettes; within the latter the enlarged sebaceous glands project forward as isolated prominent little nodules. A secondary areola quite frequently surrounds the areola, especially in dark-haired women; it is lighter in color and interrupted by unpigmented portions; a marked example is shown in Fig. 24. In rare cases striæ may make their appearance at the time of the first menstruation, owing to the distention of the skin by the developing glands. I have seen them in a very plethoric young Polish girl, while in the pregnant woman such striæ very often appear in the skin of the breast, especially at its lower part, at the time of the appearance of those upon the abdomen. They radiate around the nipple (see Fig. 24). The gland secretion may be pressed out as early as the second month. The epithelial cells of the vesicles are always free from fat, but isolated cells show open spaces at their free ends, in the interior of which are seen drops of fat and lymphoid bodies (Fig. 25). This first secretion is called colostrum; it contains small bodies showing amœboid movements, and inclosing large fat globules centrally located and held together by a hyaline substance which coagulates upon the addition of acetic acid and the alkalies. These colostrum corpuscles are cells of the glandular epithelium, from which they receive drops of fat and are heavier than serum. The colostrum differs chemically from the milk in the quantity of albumin and salts contained in it; this difference, as well as its functions, will be treated later on with the changes of the secretion during the puerperal state, and the nourishment of the new-born infant.

CHAPTER XI.

Changes Caused by Pregnancy in Other Organs of the Body.

LITERATURE.

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In the *pelvic* and *abdominal cavities.*

The bladder first suffers from increased pressure, owing to the growth of the uterus and the consequent lessening of the cavity of the true pelvis; its distention from before backward is therefore hindered, and its lateral curvature becomes greater. It is gradually drawn up out of the true pelvis by the hypertrophied uterus, until in the last months of pregnancy, there is no place for it below, and when filled it bulges out visibly above the symphysis. More than this, it is ordinarily pushed somewhat to one side, usually to the right where there is more room for it. At the beginning the *ureters* are somewhat more horizontally placed than before, while at a later period, they are drawn up and become more vertical. One or both ureters, beginning at the level of the superior strait near the uterus, are usually found to be dilated to the size of the finger or thumb, partly because of the dislocation of the bladder, and partly from the direct pressure of the uterus. The *pelvis of the kidney* is also somewhat distended. The pressure of the gravid uterus may also cause, directly or indirectly, reflex *anæmia of the kidney.* This leads to changes in the epithelium of the glomerulus, albumin is discharged and epithelial elements are found in the urine. In kidneys which are otherwise normal, these phenomena appear usually about the middle or more often toward the end of pregnancy, and occur in 2 per cent. of all cases; they disappear after labor, and, as a rule, do not lead to chronic affections. This condition is called *the kidney of pregnancy*

(Schwangerschaftsniere of Flaischlen). It has not yet been determined to what extent the dilatation of the ureters and pelvis of the kidney may influence these changes. Furthermore, the kidneys, together with the liver and thyroid gland, are hypertrophied to a certain extent in pregnancy (*Ollivier*).

The coils of the *small intestine* which reach down to the entrance of the pelvis are pushed to one side and up and away from the abdominal wall by the uterus growing up behind them; but as the colon, kidneys and liver leave very little space for the intestines, they are pushed more to the left, backward and upward. One of Braune's sections shows coils of the small intestine behind the uterus at about the fourth lumbar vertebra, but the principal mass is usually found to the left, near the fundus and behind it. This position and the varying contents, the sigmoid flexure being upon the left side, has no doubt an influence upon the revolution of the uterus upon its axis, whereby its left corner is turned somewhat toward the front. The *spleen* is also pushed upward and backward under the costal arch; at the same time it often seems enlarged and usually increases in weight (*Birch-Hirschfeld*). The *liver* and *stomach* are raised up by the fundus uteri and become more vertical (in exceptional cases horizontal). Virchow saw a case in which the lower part of the liver was reflected so as to project in front of the external border of the costal arch.

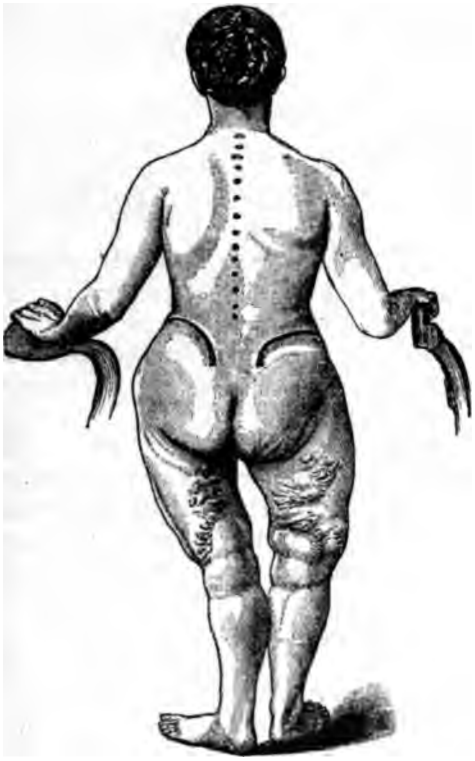
In the *thorax* there is also some disturbance of the position of the different organs. The *lungs* are dragged apart, but their vital capacity is not interfered with, for Küchenmeister, Fabius, Wintrich, and more recently Vejas (in my clinic) have not been able to find any such change, even in the last months. The capacity varies from 2700 to 3500, and is somewhat less in primiparæ than in multiparæ, on account of the flaccid condition of the abdominal walls in the latter.

The changes occurring in the *heart* during pregnancy are especially interesting. Gerhardt, in 42 cases, found *the diaphragm* higher than usual in one case only; in 36 its position was normal. Its apex, however, is more curved and the heart pushed forward against the thoracic wall, with recession of the borders of the lungs. Gerhardt, therefore, denied the hypertrophy of the left ventricle in pregnancy, reported by Larcher and Ducrest, which, according to the latter, amounted to from 11.5 to 15 mm. in the wall of the left ventricle, and ascribed the increased cardiac dullness to the recession of the edges of the lungs; the blowing sound heard over the heart of pregnancy, he thinks, is partially due to incomplete filling of the heart and partly the result of pressure upon the heart by the diaphragm. Nevertheless, an hypertrophy of the heart is undoubtedly found post mortem in a certain number of cases. These are, perhaps, exceptions; for a series of hearts of puerperal women, weighed by Blot, Löhlein and Curbelo, argue, it seems, against an existing hypertrophy, but the choice of demonstrative cases is quite difficult and their number too small, as is seen from the fact that the figure given by Löhlein as the average during pregnancy, namely, 245 gm., is the same as that mentioned by Clendenning as the average in the non-pregnant woman. Jorisenne also maintains the existence of hypertrophy, and thinks this, together with the blood changes, explains the constancy of the pulse during sitting, lying and standing, in pregnant women—a symptom which is otherwise not present unless hypertrophy of the heart exists, and which he, therefore, regards as a sure diagnostic sign of pregnancy. We have tested these statements in our clinic and found this constancy of the pulse in the different positions in only 3 cases out of 19, after the first two or three trials; in all others the pulse varied with the position. Nevertheless, I believe that the heart must accommodate itself to the greater requirements to which it is subjected by pregnancy, and for this reason must become hypertrophied. The before-mentioned hypertrophy of the liver, kidneys and thyroid gland testifies in favor of this supposition, as well as the fact discovered by my pupil, Dr. Stadler, that in advanced pregnancy the constancy of the pulse in standing and lying is not present, and that the frequency of the pulse varies with the position, in a word, that the heart must have accommodated itself to the greater task required of it. As regards the changes in the *form of the thorax* in pregnancy, Dohrn has shown that it is wider during this period than in the puerperal state, while it is not so deep from before backward. Owing to the upward curvature of the diaphragm, its crura must be subjected to a certain amount of strain, with drawing in of the base of the thorax and recession of the sternum. This decreases the antero-posterior diameter of the thorax, while its transverse diameter is greater, as is also the lateral costal curvature. The *neck* gets broader and its veins are more easily seen. The *thyroid gland* also becomes more prominent, and, according to H. A. Freund, its swelling and hypertrophy are constant. About the *head* slight pigmentation of the skin of the cheeks and forehead is not infrequently noticed. Sometimes a circumscribed hypertrophy of the gums is also noticed. This gives an appearance similar to condylomata, with marked hyperæmia in the region of the upper and lower incisors, which sometimes extends to both rows of teeth. Rokitansky has furthermore discovered the formation of *osteophytes* upon the inner surface of the cranium as a new formation peculiar to the pregnant state. He found this in more than half of the cases examined, but only during the last half of pregnancy and more frequently in young individuals. They were oftenest found on the inner surfaces of the frontal and parietal bones, usually near the middle meningeal artery and the sulcus falciformis, are at first soft and gelatinous deposits, which gradually harden until they are about 2 to 4 mm. thick, and are composed of phosphate and carbonate of lime. Hohl, Virchow and others believed they had nothing to do with pregnancy. The *skin* of the pregnant woman is more hyperæmic than usual, with increased development of the vessels and somewhat increased secretion; in consequence of this there is often pigmentation, as before mentioned, of the median line of the abdomen, the abdominal striæ, the navel, breasts and face. The hypersecretion of the skin also predisposes to the lodgment of parasites, as pityriasis versicolor. There is also a great tendency to marked venous distention and œdema. The integument of the nates and pelvic region becomes fatter, while the subcutaneous facial fat is often decreased.

The *blood* undergoes essential changes during pregnancy. Its quantity increases, it becomes more watery and poorer in red blood-corpuscles, hæmoglobin and albumin. On the other hand, Fehling's observations show an increase of hæmoglobin as opposed to the statements of Andral, Gavarret and others. The fibrin increases materially after the middle third of pregnancy (*Virchow, Regnault, C. Wolff, Kiwisch, Bollinger*). Ingerslev counted the number of red blood-corpuscles during pregnancy, and claims to have found no decrease in their number, while Fehling found they were diminished. Cohnstein also found a loss of red corpuscles in the pregnant sheep, but there was a compensatory increase of their volume and a higher percentage of hæmoglobin within them (5.5 per cent. to 7.8 per cent.).

The changes in the *urine* are in part due to the blood changes. My examinations in 1864 and 1865, which were confirmed and supplemented by my assistant, Dr. Klemmer, in Dresden, in 1876, demonstrated that the secretion of urine during pregnancy, in 24 hours, is increased from 1500 to 1750 cm., while the daily excretion of urea (28 gm.), common salt (15 gm.), phosphoric and sulphuric acids is as great as in the non-pregnant state; the urine, for this reason, is lower in specific gravity, and simply shows an increased excretion of water. The frequent presence of albumin in the urine has already been discussed. The kyestein discovered by Nauche in the urine of pregnancy consists simply of triple phosphates and low forms of life, and is also found in the urine of males. Blot, Bernard, and Kirsten have claimed to have proven that sugar is a physiological ingredient of the urine in pregnancy; this view is disputed by Riedel, Leconte, Weiderhold and Iwanoff, the latter of whom found it more frequently than had been previously supposed to be the case even in the non-pregnant state, but it was by no means exclusively and constantly present in increased quantity in pregnancy and the puerperal state. The presence of a small quantity of sugar in the urine of pregnancy more often than usual is not particularly remarkable, since, according to Seegen, sugar occurs in the arterial and venous blood of all individuals in quantities of 0.1 to 0.15 per cent., derived from the albuminous bodies used for nutrition, and besides, sugar may also be communicated to the blood by the absorption of the secretion of the mammary gland. The *arterial and venous vessels* of the pelvic organs and lower extremities may become very convoluted and distended, as well as hypertrophied, owing to the changed circulatory conditions, brought about partly by the increased tendency to new formation, and by locally increased pressure, and finally because of the continually increasing abdominal pressure. This is particularly noticeable in the common iliac and saphenous veins, as well as in those lower down. The phlebectasia appears as simple berry-like prominences, due to distention and convolution of the entire vascular system, also as grape-like protuberances of the thigh and mons veneris, or folds of the thighs (see Fig. 26).

FIG. 26.



Intense expansion of blood vessels on the back of both upper thighs.

In the dropsy of pregnancy, where increased activity of the heart is undoubtedly often demonstrated, the condition of the *pulse* is peculiar. It varies usually from 72 to 78, and often shows a slight slowing, although the pulse curve obtained by Vejas in my clinic, with Sommerbrodt's apparatus, had no marked peculiarity and showed no increase of blood pressure, and we were thus able to confirm Gerhardt's statement. Further researches of this kind are still necessary, however. My examinations of the *temperature* in pregnant women have demonstrated that it exceeds the average temperature of the non-pregnant state by an average of about $\frac{2}{5}-\frac{3}{5}$° F. This elevation depends upon the increased vital processes going on during pregnancy, and agrees with Gassner's proof of a constant increase of the bodily *weight*, amounting to from 1500 to 2500 gm. per month during the last three months. This increase, of course, is not alone due to the growth of the gravid uterus, but is participated in by the whole body. My weighings showed an average increase of 1777 grams in the last month, of which the ovum complete represented 1000 grams, the maternal genitals 150 grams, and the remaining maternal organs 620 grams (*Baumm*, p. 10).

SECTION II.

Symptomatology of Pregnancy.

CHAPTER I.

The Appearance of the Genitals in the Different Months of Pregnancy.

In the first two months the uterus enlarges slowly, and the formerly accepted *retroversion* (*E. Martin*) and sinking of the uterus at the second month have been shown to be not constant, by careful examinations of healthy individuals (*Holst*, "Beiträge zur Geburtshülf.," 1, 161). The change in the shape of the os externum from a transverse to a round configuration, the livid color of the vaginal portion, are both visible. Slight symptoms of pressure upon the bladder, nausea and morning vomiting are the sole phenomena. There are also occasional shooting pains in the breasts, and there is a certain amount of mammary secretion as early as the second month. Menstruation does not take place at the end of the first month, or if present, its duration and quantity are reduced, sometimes to a trace; it may recur twice, but seldom oftener than this.

At the third month the uterus, which has developed in all directions, becomes distinctly softer, especially the part above the utero-sacral ligaments; the hyperæmia increases and the organ is about as large as a man's fist. Sometimes many of the subjective symptoms, which will be described later, are present.

At the end of the fourth month the fundus uteri rises above the symphysis and is felt there upon palpation. The uterine bruit may be heard upon one or both sides. The abdominal walls begin to project.

At the fifth month the fundus is midway between the symphysis, and the navel; striæ commence to form and the linea alba shows pigmentation. The curvature of the lower abdomen is quite distinct. In multiparæ the vaginal portion of the cervix is relaxed, and the finger can be introduced into the external os. The fœtal heart may be heard as early as this upon careful and repeated examination, and experienced multiparæ usually feel the movements of the child before the eighteenth week; while primiparæ with a small child, since they are not familiar with this sensation, do not recognize it until one or two weeks later. Sometimes parts of the child may now be felt per vaginam or through the abdominal walls. The so-called secondary areola begins to develop after the middle of pregnancy (see Fig. 24).

AT THE SIXTH MONTH the fundus rises to a point about two fingers' breadth below the navel, and its lower half becomes flatter. The abdominal striæ and pigmentation are also more marked. The vaginal portion of the cervix is no higher than usual, but seems shorter, owing to the hypertrophy of the vagina, which sometimes forms a fold around the cervix. The body of the uterus is almost globular.

AT THE SEVENTH MONTH the fundus is about two fingers' breadth above the navel, and the pigmentation of the median line is about on a level with this. The navel is flat and surrounded by pigmentation. Usually a presenting part of the child may now be felt from the vagina, as, owing to the shape of the uterus, the cephalic end of the child is pushed downward, but may still be easily moved about.

IN THE EIGHTH MONTH the pigmentation and fundus reach a point midway between the navel and the epigastrium. All the other phenomena, the striæ and the expansion of the abdomen, are more marked, the child becomes more powerful and the mammary secretion oozes from the nipple. The upper portion of the woman's body is directed backward, owing to the displacement of the centre of gravity. The vessels of the lower extremities begin to show signs of pressure upon them, and phlebectasia and slight œdema may appear. The tension of the abdominal muscles causes shooting pains at their insertion into the costal arch and xyphoid process. Respiration, locomotion and the recumbent position, as well as going up-stairs, are often difficult.

IN THE NINTH MONTH the fundus almost reaches the epigastrium, not only flattening this space, but causing it to bulge forward. The lateral walls of the uterus extend to the costal arches on both sides. The expansion of the abdomen has reached its limit. The presenting part of the child is not easily moved, is deeper and has entered the true pelvis. In multiparæ the relaxation of the internal os is so great at the end of the thirty-fifth week, that the finger may be passed through and parts of the child may be felt. From time to time the uterus can be felt to harden perceptibly; these contractions should not be designated as "pains," as they are not felt by the mother.

IN THE TENTH MONTH (see Fig. 23) the presenting part descends gradually into the true pelvis, so much so in primiparæ that it fully enters the cavity of the pelvis. The wall of the uterus, which may be felt through the anterior vaginal arch, becomes thinner and thinner, so that the sutures and fontanelles can often be felt distinctly through the lower uterine segment.

In multiparæ the presenting part often enters the true pelvis in the tenth month, but is not so deeply situated as in primiparæ, and is more freely movable up to the time of birth because it is not so firmly fixed by the uterine walls or the relaxed abdominal coverings as in the first pregnancy. Owing to the descent of the child into the true pelvis, which is distinctly felt by the mother, the bulging of the epigastrium is less marked and respiration is easier. The navel has been flat up to this time, but begins to bulge forward owing to the relaxation of the abdomen. Uterine contractions now take place more frequently, the dilatation of the internal os is more marked, and occasionally slight tension of the membranes is noticed. The external os, however, in primiparæ with perfectly normal genitals remains closed until birth, but there is also a slight increase of pressure upon the bladder, increased mucous secretion and occasional contractions which warn them of the approaching labor.

CHAPTER II.

The Milder Disorders of Pregnancy.

LITERATURE.

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Providing the individual be quite healthy and of regular habits, pregnancy may run its course without the slightest disturbance of the general health. Women of the middle classes, who are well nourished and are not exposed to overwork, attend regularly to their daily household duties and suffer no inconvenience whatever. Still, they also sometimes suffer from slight indisposition, which, without being exactly an illness, often interferes with their usefulness. Among such disturbances may be mentioned, in the first place, the tendency to *frequent micturition*, which comes on sometimes so suddenly that the urine can with difficulty be retained. This happens without the ingestion of fluids, is of frequent occurrence, and sometimes only results in the discharge of a few drops of urine. Sometimes, however, a slight *incontinence of the urine* comes on at a later period, especially in multiparæ, upon coughing, sneezing, stooping and going up-stairs; in short, they pass a few drops of urine involuntarily upon the slightest exertion.

Pressure upon the bladder, its later dislocation and traction on the ureters, together with a certain amount of displacment of peritoneal covering caused by the growing uterus, all contribute to bring about this result, which at first is probably reflex from the uterus, and often persists after pregnancy. The desire to go to stool is rarer, but *obstinate constipation*, on the contrary, is quite frequent after the middle of pregnancy; this is often accompanied by hemorrhoids around the anus, which, however, are frequently unaccompanied by constipation.

As soon as the child's head enters the pelvis, this obstruction is due to direct pressure upon the rectum, but its occurrence in the early months, where it did not exist before pregnancy, is due partly to the abnormal position of the intestines and lessened secretion (especially of bile), and partly to lessened peristalsis or improper food. *Nausea and vomiting* also occur quite early in about three-fifths of all cases. This usually ceases about the middle of pregnancy, or else only returns at rare intervals. As a rule, the vomiting occurs usually early in the morning or after breakfast, coming on very suddenly, sometimes without nausea. When this is the case, it is probably due to reflex action, as are sneezing, coughing or the influence of bad smells. It was thought that the nausea was due to a certain degree of anæmia of the brain, owing to rising in the morning on an empty stomach, but Rheinstädter's recent explanation, ascribing it to the pronounced passive movements of the enlarged uterus against the intestines, is much more plausible, inasmuch as rest in a recumbent position often mitigates or obviates it entirely. In the later months the displacement and compression of the stomach and intestines, the hydræmia, the distention of the uterus, as well as the development of the so-called "kidney of pregnancy" ("Schwangerschaftsniere"), all combine to cause the frequent attacks of vomiting which sometimes occur at that time. *Heartburn* is usually caused by improper diet or the excessive use of starchy foods. The so-called *longings*, such as a desire to eat chalk, or sour herring, or pickles, or any object seen by the woman, are probably also referable to the condition of the stomach. Casper, for instance, mentions a woman who was seized with an uncontrollable desire to bite the red arm of a butcher, and another who could not resist the temptation of boxing everybody's ears. Hohl also relates the case of a woman who, while returning from market with her husband, threw the eggs she had just bought in his face.

Languor, *vertigo*, *attacks of weakness* and *fainting* occur readily in pregnant women, otherwise healthy, when in crowded places, such as churches, theatres and receptions, where they sit or stand quietly for a long time, in other words, under lack of fresh air and exercise. These attacks are dependent upon a certain weakness of the heart with consequent cerebral anæmia, and therefore seldom occur in strong women during the last months. *Varicose veins and œdema* very seldom develop before the middle of pregnancy, and then mainly upon the external genitals (I found this in 34 per cent.) and legs (20 per cent.), and as often upon the right as the left side. Obstruction to the return circulation, sedentary life, standing for a long time, and pre-eminently changes taking place in the vessel walls, are among the reasons for such occurrences. Rivet believed that sometimes this was simply due to the rapid development during pregnancy, thereby leading to phlebectasia and convoluted veins, as he noticed that, after the death of the fœtus, these began to disappear, even before delivery. Œdema shows itself in the evening, usually around the ankles, disappears again during the night, causes no pain, or at most slight tension, and is partly due to the obstructed circulation, partly to the hydræmia, and partly to the lessened quantity of albumin in the blood (*Lauth*).

Neuralgia, particularly implicating the distribution of the trigeminus and facialis, namely, headache and toothache, attacks pregnant women more frequently than other persons. Toothache, notwithstanding that the teeth are perfectly sound, has often led to the loss of healthy teeth in thoughtless people. Strong individuals, with a predisposition to congestion of the head, frequently suffer from headache at the vertex, forehead and occiput similar to that which occurs in hysteria; this is also due to pronounced hydræmia, excessive distention of the abdomen, marked obstruction to the circulation, and obstinate constipation; it often occurs in those persons who were predisposed to frequent headaches and migraine before the period of pregnancy.

An affection of the skin which sometimes troubles pregnant women slightly is known as *pityriasis versicolor*. This fungous growth is caused by the *microsporon furfur*, discovered by Eichstedt in 1846, and principally occurs in places where the skin is covered and warm, never upon parts which are frequently washed, as the hands and face. The fungus appears as a growth composed of filaments from 0.004 to 0.006 mm. in diameter, which have a double contour and are composed of non-branching threads with septa and rows of nuclei. The fungus is situated in the most superficial epidermic layers, and derives its nourishment from the rete Malpighi. It may be inoculated, as has been positively proven by the experiments of Wencelius. Köbner has also inoculated men and animals. The skin attacked by it looks dry and scales off easily in places; it is not red, but gray, pale brown, with a greenish tinge. Large, connected surfaces are covered (sometimes nearly the whole body), interrupted here and there by small islands of healthy skin, and there is slight tension of the skin, with itching and burning. Finally, as a rarer occurrence, may be mentioned *hypertrophy of some one of the glandular organs* of the body. The sebaceous and sweat glands of the skin show an increased secretion, especially those of the vulva, which often gives rise to a very bad odor; there is also an occasional very remarkable increase in the *secretion of the saliva*, which has been observed by Baudelocque, Bouvart, Danyau, Hohl and others. Hohl noticed it in three pregnant women, who were otherwise quite healthy, in one of whom it persisted until birth, while it diminished slightly in the others at an earlier period. The thin saliva is seen to dribble almost constantly from the mouth. As above mentioned, these troubles, though comparatively unimportant, sometimes tend to cause inconvenience to the patient, and make her at times fretful and irritable. In many cases it is not only this, but also the fear of an impending puerperal fever and anxiety about having another child, which depresses and worries women who before pregnancy were cheerful and happy.

CHAPTER III.

The Position of the Child in Utero.

LITERATURE.

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We must now consider a phenomenon which has caused physicians of all times and races many a headache, namely, the position of the fœtus in the uterus, and its causes. Let us mention beforehand that by the *presentation* of the child is understood the relation its long axis bears to the long axis of the uterus; by *attitude* of the child, the relation existing between its head, extremities and its body; and finally, *position* indicates the relation which the diameters of the presenting part of the child bears to the pelvic openings or diameters. It seems to us improper to define presentation of the child as the relation between the back of the child and the inner surface of the uterus, for this easily leads to misinterpretation of the words position and presentation. Furthermore, changes in the presentation, while effected by the contractions of the uterus, are governed by the amount of space in the true pelvis. We will first discuss the *presentation*, and pass at once to the causes to which is due the position of the head above the cervix in 96 per cent. of all cases. The most ancient explanation of this fact was based upon the position of the centre of *gravity* of the fœtus. The child was not supposed to rest in one position until its supporting part lay directly below and in a straight line with its centre of gravity; the shoulder was therefore the deepest part. The axis of the uterus, however, tends to approach the horizon, and for this reason, as soon as the shoulder came over the symphysis, the head rested upon the cervix. Scanzoni, Spiegelberg and Schroeder have advocated this view in more recent times, but it is, nevertheless, untenable.

In the first place, this theory presupposes that the child is freely movable in all directions in the amniotic fluid and thus obeys the laws of gravity. If we suppose this to be really the case at the beginning of pregnancy with a globular uterus, plenty of liquor amnii and a small child, then cephalic positions would certainly predominate at this time, while in reality we find just the opposite to be the case, for up to the fifth month pelvic positions occur as frequently as head positions, and Scanzoni's opinion that the former are only secondary positions because the fœtus is not yet endowed with normal resistance, is arbitrary, for at this time there is no appreciable difference between the resistance of the living fœtus and the liquor amnii or even the uterine wall. Moreover, Kehrer has proved that the centre of gravity lies almost exactly in the middle of the child's body in the attitude prevailing in the uterus. If the position of the child were solely dependent upon the laws of gravity, pelvic positions would hence be as frequent at the end of pregnancy as head positions, and this is not the case. Furthermore, in animals, although the lower portion of the uterus is higher than the fundus, the head is usually the presenting part, which is in direct opposition to the law of gravity; moreover, in primiparæ as well as multiparæ, changes of the position of the child are often observed, even in the last months of pregnancy: a cephalic position changing to an oblique or a pelvic and *vice versâ*, in spite of all obstacles, notwithstanding the quantity of amniotic fluid is relatively much less than at an earlier period, and the tension of the uterine and abdominal walls is much greater. We must, therefore, declare this theory to be absolutely untenable. Paul Dubois, the celebrated Parisian obstetrician, maintained that the head presentation was brought about by *instinctive movements* of the fœtus; since it moves, for instance, when pressure is applied to the cord, or upon motion or change of position of the mother; that these movements should be regarded as conformable to the object in view, and that it finally chooses the head position as the most suitable. It is true that the fœtus moves more frequently when pressed or turned about, as may often be demonstrated during the examination of pregnant women; but the movements of the fœtus also give rise to contractions of the uterus which cause renewed motion of the child. Dubois' theory has recently found a supporter in Meeh, who believes the frequent changes of position of the fœtus during the later period of pregnancy are effected by its own movements, produced by the force of the fœtal muscles, and therefore thinks the main reason for the frequency of head presentations is that the upper extremities are nearer the middle of the child and come in contact with less resistant parts than the lower extremities and feet in breech positions, and furthermore, that the upper extremities, owing to the shortness of the arm of the lever, are with much more difficulty turned away from the entrance to the pelvis than the lower extremities. Changes of the child's position, therefore, take place whenever the extremities are extended with a certain amount of force and come in contact with the hard pelvic ring, as in breech positions, while in head positions there is a longer period of rest, due partly to the interposition of the extremities and partly to the resistance offered to the head by the entrance to the pelvis and consequent interference with motion.

These theories are well grounded without doubt, but two very important factors in the changes of position of the fœtus are not considered, namely: the shape of the uterus in the first place, and secondly, the power of its contractions. If the laudable efforts of the fœtus are reinforced by the latter, then both attain their end in peace, but if they are in opposition to each other, the body of the child must give way, even though it be driven through a narrowed bony canal in the most unfavorable position (the so-called spontaneous version in the true pelvis), and be attended with fracture of its bones.

J. Y. Simpson denied the arbitrary movements of the fœtus, and thought that all movements of importance as regards its position were of a *reflex nature.* If the body were not in a position corresponding most nearly to that of the uterus, compression was applied to some spot, and the child's skin was so sensitive that it immediately answered by a reflex movement, which did not cease until the proper position was reached. Simpson, however, did not take into consideration the fact that in order to transform a breech into a head position, combined suitable movements are necessary, which must be of an entirely different character from the rapid, purposeless, reflex movements; furthermore, the uterus is not a relaxed sack, which opposes no resistance to the movement of the fœtus. The reflex movements of the fœtus, moreover, are not so frequent, nor so easily excited, neither is its skin so sensitive, otherwise it would be thrown into convulsions before birth (*Kristeller*). In opposition to these hypotheses, Kristeller has proven that the position of the normal child is wholly and entirely due *to the shape and activity of the uterus.* The uterus, by means of constant pressure upon the ovum, holds the fœtus in the most appropriate position, and gradually corrects abnormal positions by *transitory contractions.*

Kristeller justly emphasizes the importance of the intermittent contractions of the uterus during the last three months of pregnancy, which had already been referred to by Litzmann. They differ from the contractions of labor solely by the absence of pain, but merge into these without any distinct dividing line between the two kinds. The uterus is assisted in these movements, called "*corrective contractions*" by Kristeller with reference to the conversion of a transverse into the longitudinal position, by the shape and the attitude of the child, that is to say, by its bulk, elasticity and the manner of the insertion of its extremities into the body, so well described by Meeh. The sum of the forces of the uterus, owing to the constant pressure (general contents-pressure—*Lahs*), expends itself upon the long axis of the uterus; other things being equal, if head and breech are simultaneously acted upon by pressure, the head will be more easily moved on account of the mobility of the neck. Moreover, owing to the longer anterior lever arm of the head, the chin approaches the sternum. Now, since the fundus and upper part of the uterus are more powerful than the lower segment, the head must naturally pass downward from the fundus. This refers, of course, to the transitory contractions, but if these are only partial, the original shape of the uterus is changed, and the sum of the forces would naturally be expended in the direction of the longest fibres; this is corrected and opposed, however, by continually occurring changes of shape of the uterus under ordinary circumstances. Finally, in almost all cases the head position is again established as the most appropriate, and the one in which all the parts of the child are best adapted to the cavity of the uterus. Thus, the uterine pressure and the growing ovum maintain a certain equilibrium, so that no fibre is more stretched than another, and no part of the child is more exposed to compression than another. The action and frequency of the transitory contractions are readily recognized during the last months.

The recognition of the frequent changes of position of the child, by revolution upon its long as well as its transverse axis, noted by Scanzoni, Hecker, Credé, Valenta, and B. S. Schultze during the last twenty-five years, has given this theory a powerful support. As regards this change of position, it has been firmly established that transverse positions are most frequently converted into head positions, and breech quite often into head, but rarely does a transverse position become transformed into a breech. In heavy children this shifting is rarer and it is also less marked as the time of labor approaches. Rotation of the child upon its long axis, with conversion of the first into the second cranial position, often occurs with rotation of the back along the inner wall of the uterus. Deviations from head positions as well as from pelvic and transverse positions are more frequent with abnormities of the shape of the uterus or child, or in the absence of direct influence upon the ends of the child, which fact also testifies to the correctness of the above theory. In twin births, for instance, breech and transverse positions are more frequent than in single pregnancies (28 per cent. : 3 per cent.); likewise in uterus unicornis and bicornis, in placenta prævia (only 73 per cent. head) and dropsy of the amnion. In the last-named state the conditions are more like those which prevail at the beginning of pregnancy. Moreover, in such cases, the adjusting activity of the uterus is interfered with by the increased distention. In conclusion, we may mention that Hohl found 15 pelvic presentations, or almost 20 per cent., in 77 cases of hydrocephalus, which is about six times as frequent as usual. Another especially important proof is given by the well-known tendency or effort of the uterus during labor to correct a transverse position and change it to the normal, even after the rupture of the bag of waters, as is sometimes observed in so-called "spontaneous version" ("Selbstwendung"). We therefore come to the conclusion that the position and attitude of the child are determined principally by the shape and activity of the uterus, aided by the elasticity, shape and movements of the parts of the fœtus, but that the predominance of cephalic presentations is due to the following reasons, viz.: *the direction of the forces of the uterus, the greater size of the fundus uteri compared with the lower segment, the greater mobility of the child's head, the shape of the uterus and child, the one adapting itself to the other best in head presentations.*

CHAPTER IV.

The Auscultatory Phenomena of Pregnancy.

LITERATURE.

Lejumeau de Kergaradec: "Mémoire sur l'auscultation appliqué à l'étude de la grossesse." Paris, 1822. Hecker; *Klinik*, I. Winckel: "Klinische Beobacht.," I, 233, 1869. "Berichte und Studien," I, 230 Bolzoni: *Lo sperimentale*, Nov., 1884. Frankenhäuser: *Monatssch. f. Geburtsk.*, XIV, 161. Ziegenspeck, I. D. Mayor: "Biblioth. univers. des Sciences," etc., IX, 1818. Genève. Kennedy: "Obs. on Obst. Auscult." Dublin, 1833. Naegele, H. F.: "Die Geburtshülfl. Auscultation." Mainz, 1838. Attensamer: *C. f. Gynäk.*, 1887. Bumm: *Archiv f. Gynäk.*, XXV, 177. Massmann: *Monatsschr. f. Geburtsk.*, IV, 81. Ahlfeld: "Berichten und Arbeiten." Kunze: "Der Kindermord." Leipzig, 1860, 101. Schultze, B. S.: *Deutsche Klinik*, 1857, No. 28; 1859, No. 3. Kristeller: *Monatsschr. f. Geburtsk.*, XXV, 321. Bartscher: *Monatsschr. f. Geburtsk.*, IX, 294. Andrejew: *Arch. de tocologies*, 1886, Avril 15.

The sounds heard in the abdomen of the pregnant woman are referable to either the *mother* or the *child*. The uterine bruit was formerly thought a very important sound, and every effort was made to hear it as soon as possible, perhaps in the first month. The fundus uteri, however, does not rise above the symphysis during the first three months, so that an instrument was devised for the purpose of auscultation through a speculum, by the vagina, which was called the *metroscope;* but since we know that the uterine murmur is comparatively unimportant, because it simply testifies to a certain degree of distention of the vessels, such examinations have been abandoned and auscultation is not employed until a tumor is felt above the symphysis. The sounds and noises referable to the maternal system are as follows:—

1. The *uterine bruit*, or strepitus uterinus, formerly called placental murmur, which was first recognized in 1821 by *Lejumeau de Kergaradec*. It is a simple blowing sound, synchronous with the maternal pulse and heard loudest over the lateral walls of the uterus. It becomes more distinct with increased cardiac action, for instance, upon motion, it is more frequent during the pains and ceases at the height of the pain. It is often heard at different points quite distant from the uterus. It cannot originate solely in the placenta, because the rapidity of the stream at that point is considerably lessened, furthermore because (contrary to Hohl's belief) it is often heard quite distinctly after the death of the child, and also because it is usually most distinct at the lateral walls of the uterus, while the placental site is usually in the middle; moreover, because it is not infrequently perceptible in places where the placenta is obviously not located, as demonstrated by the touch in placenta prævia and placental detachment; and finally, because it is also heard in the puerperal state from 57 to 99 hours after delivery (*Andrejew*). It must therefore be produced in *the uterine vessels*, but of

course may also originate where the small arteries empty into the large venous sinuses, thus causing eddies in the blood current, and vibratory thrills of the walls. Although the name of placental bruit or murmur is quite inappropriate, and that of *uterine vascular murmur* would be better, it is still doubtful whether it may not also originate in the large superficial veins near the surface of the uterus, as well as in the arteries. I firmly believe that both factors are present, and that the murmur is *arterial* when intermittent, and *venous* when continuous, yet varying in intensity. The veins of the uterus attain a diameter of 11 to 19 mm. during pregnancy. Paul Dubois likewise held this opinion. The bruit is not produced in the epigastric or external iliac arteries, for in whatever position the patient may be in, on her back, side, or in the knee-elbow position, it is still heard over the body of the uterus, and may be arrested by pressure with the stethoscope at that point, where neither of these two arteries could be reached, and also because it increases with the pain and disappears finally at its height.

2. Scanzoni and Hecker also claim to have perceived a *murmur in the inferior epigastric artery*, recognized by the former many times and by the latter but once. I think it possible that this may have been produced by pressure with the finger or the stethoscope.

3. *Intestinal sounds* are often heard in the neighborhood of the fundus, which are due to the movement of gases and fluids in the intestines.

4. The *heart sounds of the gravida* may usually be heard above on the left side of the abdomen, and along the sides of the uterus, sometimes as far down as Poupart's ligament.

5. The *pulse of the aorta* is frequently heard over the uterus as a dull sound, synchronous with the maternal pulse—indeed, it may even be seen to raise the abdominal walls together with the stethoscope and the head of the listener.

6. The *vesicular respiratory murmur* is not infrequently distinctly heard over and below the hypochondrium on the left side; in fact, in dyspnœa or pulmonary disease of the gravid woman the respiratory murmur is so strong in the abdomen that it may obscure all other sounds. To these normal sounds may also be added three kinds of pathological sounds, which will be discussed and explained later on; these are:—

7. *Friction sounds* between the uterine surface and the abdominal walls;

8. *Crepitating sounds* due to the pressure of gases in the uterine or abdominal wall; and—

9. *Blowing sounds* within the cavity of the uterus, which may be caused by the entrance of air or the development of gases owing to the putrefaction of the child in the uterine cavity.

The *fœtal sounds* are as follows:—

10. The *fœtal heart sounds.* These are first heard at the beginning of the fifth month as distinct dicrotic sounds, ranging from 116 to 160 in fre-

quency. It was first heard by Mayor, of Geneva, in 1818. It is most distinctly heard at that point where the left side of the child is nearest to the wall of the uterus, and for this reason most frequently on the left side of the uterus at the middle point of a line drawn from the navel to the left anterior superior spine of the ilium. These sounds are distinguished from those of the maternal heart, usually, by their frequency; also because there is a certain pause between them, and moreover because the intensity of the maternal heart increases from below upward, while the fœtal sounds are more distinct from above downward. It is well to note this, as in pathological conditions the frequency may be the same in both, or the fœtal sounds may be even less frequent than those of the mother, or, *vice versa*, the fœtal heart may continue to contract as usual, although the maternal pulse rate is exceedingly high. The factors which influence the activity of the fœtal heart are, in the first place, the movements of the child, which accelerate it; secondly, fœtal diseases, such as syphilis and others; and thirdly, circulatory disturbances, whether they be produced by compression of the cord or placenta or by diseases of the mother accompanied by high temperature, as demonstrated long ago; excessive heat production is still another cause. The influence of labor upon the fœtal heart will be discussed later on. It is noteworthy that Bolzoni found the frequency to be about 128 to 144 in the majority of cases, and also noticed that the number of beats is usually in inverse proportion to the development of the child—that is to say, to its weight, length and the size of its transverse diameter. The weight is said to be always over 2900 gm. with 128 beats, and under this figure with 144 pulsations. Frankenhäuser's statement that the sex may be recognized by the more frequent pulsations of the girl's heart has been confirmed by Hennig and Ziegenspeck; but as the latter found 136 to be the average in the male fœtus and 139 in the female, the difference is so small that it is seldom possible to predict the sex, and, basing his opinion upon the careful and laborious observations of Hecker, the author and others have come to the conclusion that Frankenhäuser is mistaken. It is sufficient for us that the fœtal cardiac sounds give us very good hints as to the position, presentation and condition of the child, often aid in making the diagnosis of multiple pregnancies, and warn us of impending danger to the child, which is of the greatest importance in our obstetrical work.

11. The *umbilical souffle* was discovered by Kennedy in 1833, and is a short blowing sound synchronous with the fœtal heart, which is usually heard over the child's back, near the fœtal heart. I found it in three-fourths of all cases; it was unilateral and over the child's back in head presentations, to the left in the first position and to the right in the second; while it was very rarely appreciated on the anterior surface of the child. In breech presentations it is heard close around the navel, and in exceptional head presentations it is sometimes perceptible above the navel, extending far

beyond the fœtal heart. It does not usually disappear after the rupture of the membranes (*Hecker* and the author against the opinion of *Frankenhäuser*). It is noticed once in four or five cases of coiling of the cord around the fœtus, occurring one and a half times more frequently where there was a double coil; 33 per cent. of the cords in which it occurs are remarkably short or abnormally long. The velamentous insertion seems especially to predispose to its occurrence, as this condition is found ten times as often in cases in which the funic souffle is heard. I once heard it where an aberrant branch of the umbilical vein ran along about 8 to 10 cm. distant from the placenta (see illustration in "Berichte und Studien," 1, 247).

Death occurs in 8 per cent. of the children in whom it is observed, in 2½ to 5 per cent. of these without simultaneous coiling of the cord, but about 33 per cent. died where this complication coexisted. As regards the *place of its production*, I cannot agree with Massmann's theory, supported though it be by Ahlfeld and later on by Bumm, that it occurs *in the fœtal heart*. My reason for this is principally because quite clear dicrotic heart sounds, which also remain sharp and clear after birth, are heard not far from the funic sounds. The jelly-like nodules described by Virchow, Massmann and Ahlfeld upon the fœtal cardiac valves cannot be the cause of it, because, as I have demonstrated, they are present almost without exception, in strong, mature children, without any abnormal sounds during life, and furthermore because these deposits are always found in one place, namely, the free border of the valves, and cannot be removed without damaging the valve. They are reddish or white, pretty hard, and cause neither swelling nor congestion of the endocardium, nor exudation upon its surface (Inaug. Diss. by *Dembinski*, Munich, 1885). Hecker and Schroeder claim that the sound is produced at the *umbilical region of the child*, and although this may be possible, its constant appearance at a point over the child's back, far distant from this region, speaks against this hypothesis. The proofs that it is, as a rule, produced in the *vessels of the cord*, and for this reason should be called funic souffle and not "fœtal murmur" (*Bumm*), are as follows: it has been heard in the prolapsed funis by G. Schmidt; Kennedy and Spöndly have moreover felt the cord through the uterus wall and recognized the sound in it, and finally its location, appearance, disappearance and the area of its diffusion all indicate that it is produced in the funis. It does not seem remarkable that it should not be heard after birth in the still pulsating cord, as the pressure in the funic vessels diminishes greatly with the first respiration, and as a rule the placenta is then detached to a great extent, so that even the pressure of the stethoscope is sufficient to almost immediately arrest the stream.

The causes of its production are *tension*, *pressure* and *displacement of the cord*, in which the eddying current and vibration of the walls behind and in front of the constricted portion may even cause a perceptible vibratory fremitus of the wall.

The sound must be produced, as a rule, in the umbilical vein, since it is more superficial, distended and provided with less resistant walls and of much greater calibre than the small, more sheltered arteries; in fact, it really is the artery of the child. Finally, it may be mentioned that, although Bumm applied direct pressure to the cord in asphyxiated children and in prolapse of the funis, he could produce no sound in it. Moreover, in eleven cases where the funic souffle existed previous to birth a systolic murmur was found six times, while in sixteen cases, with previously clear heart sounds, the same result was obtained in four cases, spontaneously in three of these ten cases, and only after compression of the cord in the remaining seven; but notwithstanding the number of cases was from ten to seventeen, he could not come to the conclusion that the sound was produced in the fœtal heart in the *majority* of cases. Furthermore, Bumm's production of a blowing sound in the heart by compression of the delivered funis simply proves that, when the foramen ovale is subjected to greater pressure after the first respiration (but not before the occurrence of these changes), eddies of the current of blood and perceptible vibrations occur in the heart. I would not have gone into these ætiological data so minutely were it not that my observations upon this subject, extending over a long period of years, have convinced me *that the funic souffle is more important than is usually thought,* and I shall return to it with the discussion of funic coils, prolapses of the funis, death of the fœtus in utero, and jaundice of the newborn.

12. *The child's movements* are heard at irregular intervals as a dull sound, resembling the shock of the aorta. I have counted eighteen in one minute.

13. Hohl relates that in a face presentation, his friend, Schottin, heard and felt the child *sucking* his finger.

14. It has been shown, by my father, Kunze, Schultze, Kristeller and Dr. Wyder in the Dresden Maternity (No. 879, 1881, "Version, with difficult extraction"), that the *child may cry, vagitus uterinus,* not only in face presentations, but also during version, as soon as a sufficient quantity of air reaches the mouth.

CHAPTER V.

The Duration of Pregnancy.

LITERATURE.

Rigler: *Monatsschr. f. Geburtsk.*, XXXI, 321. (Child, 10¼lbs.) Krüche: *Deutsche Med. Zeitung von Grosser*, 1883, 370. Löwenhardt: *Archiv für Gynäk.*, III, 456. Veit, J.: *Zeitschrift f. Geburtsh. und Gynäk.*, VIII, 234. Ahlfeld: *M. f. Geburtsk.*, XXXIV, 180 u. 266. Schlichting: *Archiv f. Gynäk.*, Bd. XVI, 210. Hecker: *Klinik*, I, 33.

Even when the time of the first and only cohabitation is known, it is, nevertheless, absolutely impossible, as previously explained, to exactly determine the week, much less the day, of the beginning of pregnancy, and the date, therefore, can be an approximate one only. The same is true of the duration of pregnancy. Important variations exist in the same individual, as has long been known by observations on animals. The smaller the animal, the shorter is the time it carries its young; in the rabbit, for instance, the time is 30 days, or from 27 to 35 days; in the cat, 56 days, and the dog 60 days. Pigs require 120 days, with variations from 109 to 138, while the average in the sheep is 154, varying from 146 to 158 days; the cow, 285 days, or from 240 to 320; the horse, 340, or 287 to 419, while the giraffe and elephant require 444 and 625 days, respectively. This calculation is not absolutely correct, because the exact days of sexual intercourse are not definitely known. The calculation of the duration of pregnancy is difficult, because in the majority of cases it is impossible to obtain the exact date of impregnation, for of 5010 pregnant women whom I had examined with this object in view, only 1700, or a little more than one-third, were able to give exact information upon this point. Schlichting, in 456 cases, found the average to be 269.5 days, the time varying from 240 to 334 days, so that the woman comes next in order to the cow, not only as regards the duration of pregnancy, but also as far as the maximum and minimum dates are concerned. J. Veit, in his observations of the duration of different pregnancies in the same women, found differences as follows:—

7	times it was less than	10 days.
4	" " " "	10 to 20 days.
7	" " " "	20 to 40 days.
2	" " over	40 days.
1	" " as much as	64 days.

He believes, for this reason, that the duration is not dependent upon the type of menstruation. If we accept the theory that it is the ovum of the last menstruation which is impregnated, and calculate from the first day of this period, the following figures result:—

Mattei, average duration,	265	days.
Schlichting, 440 cases,	273.1	"
Matthews Duncan,	278	"
Wachs, Jr., according to the tables of different authors,	279.87	"
Löwenhardt-Ahlfeld, 166 cases,	281.6	"
Löwenhardt, according to Hecker,	284.5	"

These observers, however, all reported great variations, amounting to from 30 to 35 days more or less than 280 days (*J. Veit*). My experience also confirms this. As regards the frequency and limitations of these variations above 280 days, I found 70, among the 5010 previously mentioned, whose duration was over 300, and 47 in whom the period was over 302 days. Now as these 117 belong to the 1700 who gave the exact day of the successful cohabitation, it is seen that such an unusually long period of time elapses in 6.8 per cent. of all cases, in short, this is not a rare occurrence. Among them were cases in which the duration may have been 314 and 318 days, respectively. (1876, No. 250, and 1875, No. 593.) The children, a boy and a girl, measured respectively 53 and 49 cm., and weighed 3890 and 3800 grams.

I undertook these observations at the instigation of the legal authorities, in order to determine the possible duration of pregnancy, because a man already divorced from his first wife, by reason of her adultery, still sought her punishment by civil process. A new trial of the whole case showed the weight and length of the child, which had been born 310 days after the last cohabitation, to have been great, and the possibility that the duration may have been 310 days had to be acknowledged, and the woman was acquitted because the imputed adultery could not be proved by the supposed duration of the pregnancy and the appearance of the child.

The result of this discussion, therefore, as far as obstetrical and legal practice is concerned, may be summed up as follows: *The average duration of pregnancy is about 280 days; it may vary, however, from 240 to 320 days and perhaps even exceed this latter limit,* which is by no means so rare as was formerly supposed; for in 6.8 per cent. the duration is over 300 days.*

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* Dr. Krüche thinks he knew a case in which pregnancy lasted 330 days, the child (male) weighing 4250 grams.

SECTION III.

The Examination for Pregnancy, and its Diagnosis.

CHAPTER I.

General Remarks. Obstetric History.

LITERATURE.

Hohl: "Geburtshülfliche Exploration," 1833–34. v. Riecke, L.: "Der Uebungscurs in der gebúrtshülfl. Diagnostik." 1846. Stuttgart. Puzos, M.: "Traité des accouch.," publié par M. Deslandes. 1759. Chap. v, p. 55. Röderer, J. G.: "Elemen. art. obstetr." Göttingen, 1753.

In no other branch of medicine are mistakes so unpleasant and of such fatal consequences as in pregnancy. This is due partly to the fact that a mistake in diagnosis is soon recognized by the laity and talked about from house to house to the detriment of the physician, and partly because it seems to the public that it is easy to appreciate the existence of the condition in question, and the anxiety to ascertain to a certainty the presence or absence of pregnancy leads to the consultation of several physicians in succession. A great number of these mistakes are due to the physician's neglect to examine the patient in a methodical manner, and also to a lack of experience in making examinations. Furthermore, the physician is exposed to the accusation of having made a false diagnosis, whether it be due to a misunderstanding on the part of the patient in question, or owing to the kindness (?) of some well-wishing colleague whose interest it is to expose the lack of diagnostic ability of his brother practitioner. What busy practitioner has not had this experience? How often has it been said by this or that person that I had declared her to be pregnant, and that this was not the case; while I had only examined, and said that it was possible, but that there was no real proof, that a positive diagnosis could not be made under four to eight weeks, after repeated examinations. The only way to avoid this unpleasant experience is to make *methodical, thorough, exact* and *repeated examinations*, taking notes each time of the appearances found, and, above all, by abstaining from *prematurely declaring a probable diagnosis to be a certainty. It is much better to frankly say that a certain diagnosis is impossible at this early period.*

The examination should not be confined to the existence of pregnancy, but should at the same time be so complete that we shall be enabled to answer the questions which are usually put to us by our patient. We therefore begin with the consideration of the size, constitution, habit, gait and carriage of the woman, and subject her to a cross-examination as to her former mode of life. This previous history should extend to her family; whether her parents are still living or not, and if deceased what they died of; how many brothers and sisters the patient in question has; if any have died, of what disease, with especial reference to tuberculosis, insanity and convulsions; furthermore, as regards the diseases of childhood, whether she has had measles, scarlatina, diphtheria, glandular or eye diseases, not forgetting rachitis. If she is simply asked whether she has always been healthy, very little dependence is to be placed upon an affirmative answer; whereas, by repeating the question in more detailed form, we find that she has been afflicted with various diseases notwithstanding. Referring to the diseases of advanced childhood, it should not be forgotten to ascertain whether convulsions, chlorosis or headache have existed. From childhood we pass to puberty and inform ourselves as to the appearance of the first menstruation, its duration, return, whether it has ever been accompanied by any other disorders, or has ever failed to make its appearance. If the physician wishes now to have his diagnosis uninfluenced by the statements of his patient, it is better to interrupt the history at this point, and complete it after he has made his examination. However, should this not be convenient, he may continue to question as to the occurrence of more serious diseases, such as typhus, dysentery, intermittent fever, articular rheumatism, heart and lung diseases, and whether abortion or the birth of a mature child has ever taken place. Persons who are attentive can usually give the details of such occurrences: when they took place, how long the birth lasted, whether the delivery was complete, whether there was great hemorrhage, the presentation normal or abnormal, how the placenta was delivered, whether a physician was necessary, whether the puerperal state was regular or not, also as to whether the child was nursed by the mother or not. All these answers will convey hints to the physician, will explain many of the appearances noted, and aid him in giving advice to the patient. No pregnant woman should object to a thorough and detailed examination, and although some of the questions will not be positively answered or may cause amusement, if the physician explains the motive of his questions, the woman will understand the drift of them and will think the matter over and finally endeavor to give satisfactory answers which may have an important bearing upon the case. Nothnagel, in his inaugural address at Vienna, especially emphasized the importance of an exact history. I can likewise confirm this as regards obstetrics, and urge you to bear it in mind, for the history not only gives us information as to the whole previous life, but also concerning the mental capabilities of the woman, her memory, her intelligence and reasoning powers, her moral nature, especially truthfulness, and sometimes it shows us whether she has any reason for concealing certain occurrences or wishes to deceive us in any way.

CHAPTER II.

The Obstetric Examination.

LITERATURE.

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The obstetric examination is divided into the *external* and *internal;* both are equally important, but one or the other may not always be feasible, on account of certain anomalies, so that we are restricted to one of them only. In order to avoid unnecessary repetitions, both should be made, from first to last, as complete as possible.

The *external examination* may begin with inspection of the *breasts*, and we shall proceed in the same order, as this point unfortunately is often overlooked. The end in view is not only to note the diagnostic signs of pregnancy present in them, but also whether they are adapted to the purpose of nursing, whether they need any preparatory treatment, and whether they have already been utilized in this manner. The size, projection and coloration of the nipple and areola are observed, and the presence of striæ noted; scars denoting an antecedent suppuration of the mammary gland should also be looked for. The form of the breast, whether it is solidly implanted or hangs down loosely, is of importance as regards the question of previous nursing. Furthermore, the existence of pityriasis versicolor, or intertrigo of the skin of the breast, is of consequence. All these data are secured by simple *inspection*, which is now followed by *palpation*. Note the facility with which the nipple may be seized, the thickness and mobility of the skin, and the condition of the gland and its secretion. The thickness of the panniculus adiposus is seen by raising the skin up from the gland, and also how much of the breast is taken up by the gland tissue itself. Moderate pressure upon the body of the gland, following up the milk ducts, causes a little fluid to ooze out upon the surface of the nipple even at an early period of gestation. In some cases the sense of taste may aid in testing the secretion, and also in ascertaining why the child, for instance, takes but one breast, for the quantity of sugar and salts may differ in the two breasts. The microscopical examination of the mammary secretion will be considered subsequently.

The external examination of the *abdomen* is conducted in the same manner, beginning with *inspection*, to be followed by *palpation*, *percussion*, *auscultation*, and finally by *mensuration*. I have always been in favor of direct examination of the uncovered abdomen in both the erect and the recumbent positions; for if this be not insisted upon, most of the advantages which are offered by inspection of the abdomen are lost. The degree of distention and the shape should first catch the eye, and we note whether the abdomen bulges symmetrically or whether it comes to a point or is pendulous; and also the presence of striæ the result of a former confinement, whose quantity, color, site and folds are noted; furthermore, the condition of the navel, if deep or shallow, level with the abdominal wall, or perhaps, in the case of a small hernia, protruding from it. Swellings of the skin, of an œdematous or inflammatory nature, and greatly distended veins are also obvious if present. At the same time the pigmentation of the linea alba should be noted; it usually extends as far up as the fundus uteri. Movements of the abdominal wall, the result of the peristalsis of the intestines, the respiratory movements, contractions of the uterus and movements of the fœtus, often give us valuable information; a single glance at the bare abdomen during a powerful movement of the child often informs us that the woman is pregnant, and that the child is alive and in a position corresponding to the long axis of the uterus. The position of the fundus may also often be recognized solely by means of the eye during respiration. The globular protrusion of the distended bladder is also noticeable when the patient breathes, and is of especial importance. Finally, the buttocks should be examined for striæ and œdema, as also should be the condition of the spinal column and posterior pelvic wall.

Palpation may begin with testing the quantity of adipose tissue present and the tension and thickness of the abdominal walls, passing on next to the position of the fundus, noting its distance from the symphysis, navel, ensiform cartilage or costal arches, as the case may be. The abdominal walls may be depressed about the fundus in order to exactly determine its shape and breadth. The lateral surfaces of the uterus should now be felt with a view to ascertaining the amount of resistance, thickness, tension, shape, mobility, sensitiveness and unevenness of its walls. The palpation of the contents of the uterus is next undertaken; the part of the child at the fundus is fixed with the hand and then moved repeatedly backward and forward while the other hand is ready to detect the movement thereby produced, and to distinguish the extremities of the child, their number, size and nature. Having succeeded in this, the upper hand next passes to the broad back of the child, and seizing it, the pointed end of the body is directed downward toward the lower segment of the uterus, and the head can then be found perhaps resting over the entrance to the pelvis. Where the abdominal walls are thin and loose one sometimes succeeds in distinctly feeling the cord, when coiled around the back or neck (*Kennedy*, *Spöndli* and the author). The course, thickness and tension of the round ligaments, and perhaps one of the ovaries, may likewise be appreciated. It is very convenient to map out the outline of the uterus upon the abdominal wall with a colored pencil, marking the position of the back and small parts within this outline, and afterward adding the results of auscultation. In this way a more exact idea is gained of the shape and position of the uterus than by simple palpation.

We next take up *percussion*, in cases where there is any doubt, namely, in cases of thick abdominal walls or where there is a suspicion of the existence of a tumor of some kind. It is well to indicate the area of dullness with a blue pencil, and also to outline the lower border of the liver and the spleen. Palpatory percussion is more useful than is auscultatory percussion in determining the presence of free ascitic fluid in the abdominal cavity in addition to the uterine tumor. The left hand is arched slightly and laid upon the surface of the abdomen, so that only its radial and ulnar borders, and the thumb, middle and little fingers touch the skin; gentle percussion is then applied to the middle finger, and the wave thus caused is felt at once by all the parts of the hand which are in contact with the surface. Sometimes the nature of protuberances in front of or upon the wall of the uterus, whether they be solid bodies or coils of intestine, is only determined by percussion, as well as the presence of gases in the cavity or walls of the uterus.

The method of *auscultation* is as follows: The stethoscope is applied to that part of the abdominal wall where, according to palpation, the left side of the child is situated, or rather where its left shoulder is to be found. This spot is usually to the left of the abdomen, about a hand'sbreadth from the median line. Having distinguished the *heart beats* by means of their two sounds, it should next be noticed in what direction they become weaker and where they are strongest. In this way mistaken ideas as to the child's position are not infrequently corrected. Furthermore, the heart beats of the child must be counted, and it should be ascertained whether adventitious sounds are present, or whether the heart sounds are absolutely normal. The *umbilical murmur* is also most frequently found in this neighborhood; its frequency, intensity, area of transmission, duration and changes are all points of interest. It is advisable to mark the points upon the abdomen where the sound is heard, and then compare it with the frequency of the fœtal heart and maternal pulse, for it is very easy to mistake this for the *uterine murmur*, which is slower, unless some such precautions are taken. If the uterine murmur be not present at first, it may, perhaps, be heard after the patient has walked up and down the room several times. If both sounds are heard, then the points must be located at which they are most easily distinguished from each other.

The movements of the child should next be observed; they may be caused by applying the cold hand to the abdomen, or by moving the child vigorously about in the uterus with both hands. Intestinal sounds, the shock of the aorta, rubbing sounds between the uterus and the abdominal walls, respiratory sounds and the heart of the mother, should all be included in our examination. While auscultation is being performed the room should be quiet and all unnecessary clothing removed from the woman's abdomen, the patient being in as comfortable a position as possible, as well as the physician, so that he may not be deceived by sounds caused by congestion of his own head. It sometimes requires a great deal of patience and persistence to hear the fœtal heart so distinctly that there is no longer any doubt as to its existence. Its discovery may be facilitated by grasping the breech of the child with one hand and forcing its back more firmly against the wall of the uterus; the death of the child is also more positively determined in this way, because the entire surface of the child's back may be more easily auscultated. It is often better to put the woman upon her side, as in this position the uterus is better supported from below, and its upper surface is more accessible to our ear. It is, furthermore, advisable that there be a free space upon both sides of the couch upon which the patient lies. Either the unaided ear may be used or the stethoscope; in the former case, however, the ear cannot be applied to the fold of the groin or lower abdomen, especially if the latter be pendulous. On the other hand, the use of the stethoscope is painful when the abdominal integument is very much swollen or sensitive. Both methods have their advantages, and the one or the other may be used according to the experience of the examiner, but the stethoscope is undoubtedly more advantageous, owing to the facility with which it may be used in deep places, and also in examining different points very near to each other.

After auscultation comes *mensuration*, in order to determine the form and distention of the abdomen, the height of the navel and fundus uteri, as represented by figures. We measure the greatest circumference of the abdomen during expiration and note the location, and then directing the patient to stand erect, measure it again in the same place, or better still the tape is held in the same place while she is getting up, in order to see whether the periphery is greater in the standing than in the recumbent position. The distance of the upper border of the symphysis from the navel, the highest point of the fundus uteri, and its distance from the ensiform process should then be measured in both positions. Furthermore, the relation of the vulva to the pelvis should be considered, whether far back or more to the front; and, moreover, the condition of the lower extremities is of importance; whether the bones are straight or bent, especially in the case of the tibia; whether and where œdema or varicose veins are present, or whether other affections or abnormities obtain, as exanthemata, scars, ulcers, or swollen joints.

Finally, we come to *external palpation of the pelvis* and inspection of the spinal column: the *pelvic measurements* are undertaken, aided by the pelvimeters of Baudelocque, E. Martin, or Skutch. We measure: (1) *The distance between the anterior superior spines of the ilia*, according to G. A. Michaelis. We place the ends of the instrument upon the tense fasciæ latæ, and not directly upon the spines. Upon the skeleton the distance is 24 cm., in the living subject, 26 cm. (2) The *distance between the crests of the ilia.* The points of the pelvimeter are moved along the labia externa, until the greatest distance is found, which is 27 cm. in the skeleton, and 28 cm. in the living subject. The relation and importance of the measurements have been very well explained by Scheffer, under Dohrn's guidance. Their length, as well as any important difference between them, allow us to draw our conclusions as to the development of the innominate bones, and the width of the transverse diameter of the pelvic inlet. (3) The *conjugata externa,* or *diameter of Baudelocque,* extending from the spinous process of the last lumbar vertebra to the upper border of the symphysis, which is 19.5 cm. in the living subject and 18 cm. in the skeleton, is measured. This spinous process is the second elevation felt over the middle of a line passing between the depressions of the posterior superior iliac spines, the first one being the spinous process of the first sacral vertebra. (4 and 5) The *diagonal diameters of the large pelvis:* from the depression marking the posterior superior spine of one side to the anterior superior spine of the opposite side, which is 22.5 cm. during life, and 21.5 cm. on the skeleton. In symmetrical pelves they are constantly equal to each other, with variations from 1 to 3 mm. only, and aid greatly in the calculation of the diagonal diameters of the pelvic inlet. (6) Finally, at the end of the internal examination the *conjugata diagonalis* is measured, either by instruments or by the hand (see chapter on Contracted Pelves), which, as already mentioned by Michaelis, may be determined with the two outstretched fingers if the pelvis be not too roomy. As soon as the promontory of the sacrum is reached, the tip of the middle finger is placed against its centre, while the radial border of the index finger is raised up until it meets the pubic arch, and a mark is made upon it just in front of the ligamentum arcuatum, with the nail of the index finger of the left hand; the distance between this mark and the tip of the middle finger is then measured by an appropriate instrument, but this instrument must be pressed just as hard against the end of the finger as the finger was pressed against the promontorium. The average length of this diameter is 12.5 cm. in the symmetrical pelvis. In order to calculate the *conjugata vera* from this measurement, in the normal pelvis, an average deduction should be made of 1.5 cm., or, as has been recently maintained, 2 cm. Of course, the difference may be more or less, according as the symphysis is higher or lower, the conjugata vera shorter or longer, or the angle between the conjugata and symphysis greater or less, and finally, according as the promontorium is higher or lower. A more detailed consideration will be given this subject in the discussion of contracted pelves, together with the other remaining measurements. (7) The *circumference of the pelvis* should also be measured, over the symphysis, under the crests of the ilia externally, and over the middle of the sacrum behind.

In a person who is not too stout, and with a normal pelvis, it measures 90 cm. The distance *between the trochanters* is unimportant, except in isolated cases, as reported by Michaelis, owing to the too great variations.

Before beginning the *internal examination*, it must be borne in mind that, owing to the greater congestion, relaxation and susceptibility of the mucous membrane of the genitals during gestation, it is much more liable to injury and inoculation by the hand than would be the case otherwise. We should, therefore, first carefully disinfect the hands, the nails of which must be short, of course, with a 3 per cent. carbolic or $\frac{1}{10}$ per cent. bichloride solution, and likewise wash off the genitals externally or give an internal injection of an antiseptic fluid. Where bichloride or carbolic acid are not at hand, the hands should be most carefully washed with soap and water, and scrubbed with a nail brush. Moreover, as long as any odor clings to the hands from a previous examination of another pregnant woman or diseased person, the exploration should not be undertaken under any circumstances. If but one hand be affected, the other hand may be used if it is absolutely necessary to make the examination. At least two fingers of the hand should be smeared with oil or 5 per cent. carbolized vaseline in order to protect the parts and to avoid infection upon the part of the physician. In cases where diseases of the external genitals exist, with copious discharge of pus, the vulva should be inspected before introduction of the finger, and the labia separated with the other hand in order to avoid contact with the diseased places if possible. The internal examination should be carried on with the patient in the recumbent position, with the physician's external hand upon the abdomen; rarely in the standing position. The points which demand attention are as follows: prominence of the labia minora; the presence of the frenulum, of œdema, varicose veins; the width of the rima vulvæ and displacement of the vaginal walls. Palpation with the fingers will usually dispense with inspection as to these points. The right fore-finger is first swept up over the *perinæum* and introduced into the *vagina*, while the rest of the fingers are spread out over the perinæum, for it is obvious that this is the most natural disposition of the fingers. I remember, however, a physician who subsequently became quite celebrated, who examined his first case in my presence by introducing his thumb with the volar surface directed upward. The width, length, condition of the walls, temperature, secretion, and amount of swelling of the vaginal walls should be ascertained, also the condition of the urethra and posterior walls of the bladder, the recto-vaginal septum, the site and contents of the rectum, since the distention of both of these organs by their contents is of great importance as regards the position of the lower uterine segment and the presenting part of the child. Hard fecal masses have often been mistaken for a contracted pelvis, but moderate pressure is usually sufficient to flatten, indent or displace them. Furthermore, the position and shape of the vagina, whether almost horizontal on the floor of the pelvis or displaced in any direction, as well as the tension of its walls, are all points of diagnostic importance. The internal examination of the uterus begins with *the vaginal portion of the cervix.* This may be found by first passing the finger back to the coccyx, and then feeling for the apex of the sacrum (the portio vaginalis is usually several centimetres in front of this), and bringing the hooked finger, with its concavity directed forward, back toward the symphysis; the vaginal portion is usually met upon the way, or the cervix may be more easily found by seeking the spine of the ischium upon one side, which is quite distinctly felt, and crossing over to the spine of the other side, when the external os is usually encountered somewhat behind the line connecting the two spines, or finally, one or two fingers are simply introduced and moved around until the cervix is felt.

The obstetrician ought to be ambidextrous, and it is his duty, when he cannot obtain positive information with one hand, as to the cervix, parts of the child, etc., to reëxamine with the other hand. It is also important to examine the pregnant woman in different positions. As soon as the external os is found, its location should be exactly determined; also whether its shape be round, oval or conical; moreover, the condition of its lips, whether thin or thick, hard or soft, smooth or uneven; its border notched or sharply defined.

Likewise, we examine the *commissures* and note whether one is higher than the other or on the same level, also whether the vaginal vault shows any cicatrices about the higher commissure, and whether the cervix possesses its normal mobility. The direction of the os should also be noticed, whether it looks forward, backward, or to the one side, and at the same time the length of both lips may be estimated, or the depth of the anterior and posterior fornix ascertained and compared with the thickness of the corresponding lip of the cervix, for thickening of the lip is usually accompanied by deepening of the vaginal vault. The finger should now be introduced into the external os and its degree of dilation determined by comparison with the size of well-known coins, as by so doing a better idea is given to many than when the size is expressed in centimetres simply. The finger is now passed on slowly, noting the condition of the cervical mucous membrane, and measuring the length of the cervix by the first phalanx of the entering finger, until the internal os is reached. If it be open, the membranes and parts of the child are felt; the tension of the former is important, together with their thickness and adherence to the wall of the uterus, as well as the size, shape, hardness, mobility and characteristic landmarks of the presenting part of the child. At the same time the external hand should exert moderate pressure over the symphysis, so that the presenting part is prevented from receding too much from the examining finger. The shape, condition of the borders and amount of distention of the internal os are now compared with the external os. If neither the external or internal os be open, the lower uterine segment must be carefully examined as to its surface, shape, thickness of its walls, resistance and contents. In the latter part of pregnancy the landmarks of the head, sutures and fontanelles may be felt through it, as already mentioned. Regarding the condition of the walls, there are often found a greater or lesser number of excessively developed, rapidly pulsating arteries, and it should be ascertained whether these are really within the wall of the lower uterine segment or are outside of it entirely, as in cases of pelvic deformity, one common iliac artery may pass down into the cavity of the true pelvis.

In some cases, after palpation, the exploration is continued with the speculum. This is indispensable in the early months when the diagnosis is not absolutely certain. We use the speculum in order to recognize the livid, bluish color of the vagina and cervix, which is intensified above. Specular examination is also necessary when any diseases of the vagina, vulva and uterus have been detected by palpation. In most cases the speculum is not absolutely necessary, and when it is used, the instrument must be longer than that used for ordinary examination ; one of the most suitable is the fenestrated speculum of Simon, or those similar to it. Of course, it must be perfectly clean, well oiled and warmed. The portio vaginalis is sometimes very difficult to find in the pregnant state, owing to the lengthening of the vagina and thickening of the cervix; this is especially true of the last months, when it is impossible to discover it without considerable displacement of the presenting part. For such case, the lateral position and Sims' or Simon's concave specula are to be recommended. Besides the coloration, projections of the mucous membrane, and its transparency, should be noted, and one should be on the look-out for epithelial exfoliation and ulcers of the entire mucous membrane, so far as it is visible, or hemorrhages into its tissues. Just above or near the speculum, but at a part untouched by it, some of the *secretion* of the vagina and cervix should be removed for *microscopic examination,* and its reaction should also be tested by means of litmus paper, both in the vagina and the cervix. The examination by the speculum also shows us the source of an existing hemorrhage, whether from the vagina, the lips of the cervix or within the latter, and which of the parts is most affected by disease. Finally, after the cervix is fixed by means of the speculum, the thermometer may be introduced into it in order to take the temperature, not forgetting that the lower segment cools off somewhat, owing to the entrance of air through the speculum. This method of thermometry is only used when the thermometer cannot be otherwise introduced, and the speculum is withdrawn as soon as this is accomplished. Before using the speculum, and in fact, before internal examination, the bladder and rectum should be completely emptied, even when they contain but very little.

Rectal Examination of the Pregnant Woman.—After the bowel is emptied, one, two, four or five fingers may be introduced; it is in general rarely necessary and is governed by the same rules as the vaginal exploration, and should be always bimanual. Usually, one or two fingers are sufficient, nevertheless, the presence of tumors in the true pelvis or the wedging in of the excessively enlarged gravid uterus may necessitate the introduction of more of the hand. I have, however, never been obliged to use the whole hand in the rectum, according to Simon's method, in a gravid or parturient woman, and as it is well known to be a dangerous procedure, and since the uterus and its surroundings may be sufficiently well appreciated by external palpation, I cannot too earnestly deprecate its employment. The principal object of rectal examination is the recognition of the posterior and lateral pelvic walls, the promontory and its vicinity, the lower lumbar vertebræ, lower parts of the uterus, tumors of the posterior walls, as well as tumors in the cul-de-sac of Douglas, in the recto-vaginal septum, and in the tubes and ovaries. Simultaneous counter-pressure must be made from the vagina, with the thumb of the same or by the other hand. The most rapid method of taking the *temperature* is by the rectum, especially during labor, when, owing to the dilatation of the vagina, the thermometer is apt to be displaced. The axilla is unreliable on account of the growing restlessness of the patient, and the long time necessary for registration at that point.

We have supposed, up to this point, that we have had to deal with women who were undoubtedly pregnant, and we have described the method of examination in accordance with this supposition. Certain modifications are necessary, however, if upon palpation of the abdomen only general tension and resistance are felt, or distention without the obvious presence of a distinct tumor. In this case, after palpation, percussion should be employed as carefully as possible, mapping out all the different organs and areas of distention; the patient should also be put upon the back, upon the side and in the knee-chest position, and carefully percussed at all points where changes in the percussion note are remarked. The urine should be drawn and examined for albumin and casts; the nurse being directed to administer an enema in the mean time, so as to render the abdomen softer, and especially to lessen the tension of the bladder and improve the percussion note. Now, if the abdomen is distinctly tympanitic as far down as its lower part, or the presence of fluid is indicated by a line of flatness, the concavity of which is directed above, palpation should again be employed by cautiously and steadily bearing down upon the abdomen between the recti without too much pressure, until the aorta is reached. If it is felt, its pulsations should be counted in order to be certain of its identity. It should then be followed down to about two finger-breadths below the navel, where it usually bifurcates into the common iliacs, which may be raised up together with the aorta by means of the index finger. In this way, the promontory and intervertebral discs may be felt, and finally, the whole superior strait, where any tumors present may be appreciated, even though they project but very little from this cavity.

In cases of very fat abdominal walls, the examination may be facilitated by having an assistant lift up the thick skin of the abdomen in the median line, and then percussing and palpating at the sides. This method is based upon the fact that the accumulation of fat is usually greatest at the median line and around the umbilicus, and, furthermore, artificial tension produced by the patient herself is more easily overcome by combined force than when unaided. Of course, methodical measures are necessary, and one can accomplish nothing without a clearly defined purpose. I have, for instance, succeeded in a short time in proving to several women that no tumor of the abdomen was present, although it had been supposed to exist for years, and had even been aspirated in one case. If this method does not lead to the result in view, then the diagnosis remains doubtful, either because it is impossible to accomplish the relaxation, or the palpation causes too much pain, or the distention is too great. And, furthermore, should both percussion and palpation fail to reveal the exact nature of the tumor, if indeed a tumor be present, the better plan is to withhold an opinion, unless the woman's life be in immediate danger, which would, of course, render an immediate diagnosis necessary. If there be no immediate danger, the person in question should be told that it is impossible, for the moment, to make a definite diagnosis, and then examine her again after the lapse of a certain time. In this way, the patient is often spared a good deal of inconvenience and pain, and the physician is not exposed to disgrace and reproaches; for very frequently, in a few days, changes will have taken place which will enable him to recognize clearly the true condition by the second examination. In cases where an immediate decision is necessary, where delay would be dangerous, and an examination is difficult owing to excessive tension of the abdominal walls, or the tenderness or narrowed condition of the genitals is marked, an *anæsthetic* may be employed, either laughing gas or chloroform, or a mixture of chloroform and ether, for one need have no fear of the skillful employment of anæsthetics, either for the mother or the child, since tedious, bloody and dangerous operations may be performed under narcosis, such as ovariotomy for instance, without interrupting the course of pregnancy. Having finished the obstetrical examination as such, some of the results found may lead us to examine the organs implicated in pregnancy, as for instance, the urethra, bladder and kidneys, spleen and liver, and finally the heart. Whenever even slight traces of œdema are found, the quantity, specific gravity and appearance of the urine should be noted, and it should also be examined for albumin and casts. When the presence of vaginal mucus is suspected in spontaneously discharged urine, the urine should be drawn with the catheter. *Many a pregnant women has albuminuria* without hydræmia or œdema, and it is, therefore, recommended that the condition of the urine be carefully examined even in apparently perfectly healthy individuals. It might also be tested for sugar, but this is seldom present, and is not so important as albumin, as it usually exists to an insignificant degree, is mostly transient in character, and often found in the puerperal state without affecting the health of the patient.

In pale and œdematous gravid women the *auscultation of the heart* for anæmic or valvular murmurs is very important, owing to the liability to great circulatory disturbances, especially if the latter be present, and many of these troubles may be averted by timely treatment.

CHAPTER III.

Relative Value of the Different Signs of Pregnancy.

These signs are divided into *doubtful*, *probable* and *certain* signs. The first may also occur in the *male*, the second proceed solely from the genitals of the *woman*, while those of the third category are only produced by the presence of the *child*.

I. To the class of *doubtful signs* belong all those phenomena which are due partly to pressure, and partly the result of blood changes or of changed nervous activity. These are nausea, vomiting, fainting, varicosities, œdema, headache, toothache and backache, as well as pigmentation of the skin, frequent micturition, and "longings." These signs, as such, have no value whatever, except in the case of multiparæ who were usually free from such symptoms, who have noticed the same series of signs of this nature come on early in previous pregnancies, and have thus been able to recognize their condition even before the cessation of the menses; in some cases, even, the fruitful coitus has been recognized by the almost immediate occurrence of vomiting, persistent nausea and depression of spirits.

II. The *probable signs*, proceeding from the female genitals, are more important and are as follows: (1) *Cessation of the menses*, which is especially valuable in those who have always menstruated regularly and copiously; but still it is not a sure sign, for many different diseases, as anæmia, chronic and acute diseases like phthisis, may cause menstruation to cease; in some acute diseases—for instance, diphtheria, pneumonia and dysentery—the courses may be delayed one or two weeks, or even some months. On the other hand, it may continue during pregnancy until the middle months in a quite typical manner as regards timely appearance, although lessened in duration and quantity.

(2) *The changes in the color of the vulva, vagina and uterus*, the palpable

pulsation in the vaginal fornices, the increasing size of the uterus, the changing of the external os to a rounder shape, and finally the more recently emphasized unusual softness, elasticity and thinning of the uterus immediately above the insertion of the sacro-uterine ligaments (*Hegar-Reindl, Prager med. Wochenschr.*, 1884, Nr. 26), which is said to be quite as pronounced in the soft elastic as in the solid hard uterus—even all these have only a relative value and may occur in certain diseases of the uterus, as in chronic metritis or soft submucous myomata with commencing development of the pedicle, etc.

(3) The *uterine murmur* is sometimes absent, and at most only leads to the inference of excessive development of the veins or arteries—it may also occur in large myomata of the uterus and not rarely in ovarian tumors, but it certainly is most frequent in pregnancy.

(4) *Breast changes.* The increase in volume, hypertrophy of the nipple and pigmentation of the areola may occur in disease, such as dysmenorrhœa and uterine tumors. Moreover, the pigmentation of the areola and the unusual prominence of the tubercles of Montgomery do not disappear from one pregnancy to another, or do so only partially. The finding of colostrum in the breasts of persons who have not been ill or recently delivered, is always a very important probable sign, but it is not a certain one, for the secretion may persist long after the removal of the child from the breast, or from one pregnancy to another (galactorrhœa), and, finally, persons who are not pregnant and never have been, as well as women after the menopause, not infrequently are able to squeeze a few drops of a clear liquid out of the breasts.

(5) *The striæ and umbilical changes* are not constant, but occur certainly very frequently; they never entirely disappear; they may also be caused by ascites, uterine and other abdominal tumors, even in young persons. They have the same significance when found upon the thighs, buttocks and breasts. However, they are seldom caused except by pregnancy, and if so, the cause is easily ascertained from the history, so that they are admitted to the probable signs with a certain degree of justice. Although no one of these signs is of great value, still the diagnosis is more certain the greater the number of them present.

III. *The certain signs* indicative of the presence of the child are as follows:—

(1) *The feeling of the fœtus* through the uterine walls. It is the most certain of all, because it is always appreciable; even in commencing abortion the end of the child may be felt in utero, or in the case of a dead child, when all other sure signs fail. Mistakes are also possible here, of course: parts of a tumor may be mistaken for parts of the child, or the child's head for a tumor. I even remember the case of a young woman, where an experienced colleague called me in to open an hæmatocele which was said to be about to burst, and which proved to be the child's head in the vagina!

(2) Positive proof is furnished by the *fœtal heart sounds* when heard distinctly and compared carefully with the pulse of the mother and that of the examiner. One of my students heard a double sound at the rate of 120 per minute to the right and above Poupart's ligament, and would not believe that it was the patient's heart sounds until I showed him next day, at the ovariotomy, that she was not pregnant. In my clinic, some time ago, I also presented a pregnant woman whose child had died in the uterus, and who was delivered of a macerated child the day after; notwithstanding this, a physician thought he heard the fœtal heart beating 130 times to the minute, and could not be convinced he was mistaken until he saw the *macerated* child the next day.

(3) *Movements of the child* are a certain sign, when they are confirmed by an experienced examiner, but the statements of the patient have no value, for, in changes of position of the uterus, and in fat persons who are very anxious to become pregnant, movements are so distinctly felt that they are willing to swear that they are in the gravid condition.

(4) The *umbilical murmur* occurs in 10 to 15 per cent. of all cases, and, therefore, needs no proof that it is a positive sign. Its importance for diagnostic purposes is not to be undervalued, as by means of auscultation it may be heard alone, and at a distance from the heart sounds. The signs proceeding from the child are all heard about and after the middle of pregnancy, and it is seen, therefore, that an absolutely certain diagnosis of pregnancy cannot be made prior to this time. We may, however, by means of careful and repeated examinations usually predict its very probable existence as early as the third or fourth month.

CHAPTER IV.

Differential Diagnosis of Pregnancy and Certain Morbid Conditions.

According to what has just been said, the diagnosis is most difficult from the second to the fifth months of pregnancy, and as the uterus at this time varies in size from a goose's egg to the size of a child's head, all those conditions may be mistaken for pregnancy which produce large tumors near or within the uterus. We will only discuss these in detail here, and will consider them in the order in which they present themselves during the examination as previously described.

We will mention *abnormally fat abdominal walls* in the first place, which may not infrequently lead to mistakes in very young, somewhat anæmic women. The displacement of the thick layer of fat, the use of percussion, and the demonstration of the tympanitic percussion note, as well as the absence of enlargement shown by rectal and vaginal explorations, and, furthermore, the persistence of the menses at regular intervals, although only in small amount, and finally, the unchanged condition found at repeated examinations, together with the absence of other signs of pregnancy, all tend to confirm the diagnosis.

Excessive and persistent distention of the bladder may at times be mistaken for pregnancy, because the position, resistance and shape of this organ bear a certain resemblance to the pregnant uterus, and in retroversion of the gravid uterus the distended bladder has often been mistaken for the uterus. How often this is forgotten by students and physicians in their examination of the lower abdomen, notwithstanding they have daily opportunity to convince themselves of this fact, and are so frequently warned to regard it as a possible contingency, and to withdraw the urine immediately with the catheter if this condition cannot otherwise be positively excluded!

Chronic metritis and myomatous tumors of the uterus are slowly-growing, usually solid enlargements of the organ, associated not infrequently with uterine murmurs and hyperæmia of the organ, but with complete absence of the remaining signs of pregnancy. The history of these cases is particularly valuable; the menses, as a rule, are not entirely missing and there is little or no change in condition for weeks and months, so that then the use of the sound is permissible and the diagnosis is thus established. Both conditions, however, may complicate pregnancy, which would positively contraindicate the use of the sound, so that it is only employed when repeated examinations have demonstrated the non-symmetrical growth of the uterus and the myoma distinctly projecting from that organ.

Ovarian tumors, especially unilateral cysts, may be so adherent to the uterus at first, especially when the ovarian ligaments are short, that it is impossible to distinguish them; the consistence of the slowly growing tumor is the same as that of the gravid uterus; the surface is also frequently round and without special unevenness, but menstruation is usually present, and the other signs of pregnancy are absent; the vaginal cervix is more solid, often deeply invaginated and displaced; furthermore, the tumor shows great differences in consistency and soon elevations begin to show themselves in isolated places, and finally the rapid increase of the fluid contents becomes evident and the fundus uteri may be differentiated from the tumor by bimanual palpation.

Atresia of the vagina or uterus and hæmatometra, after existing for months, cause tumors which are very like the gravid uterus; cessation of the menses, evidences of pressure, nausea, and more or less severe recurrent typical violent pains are likewise present. Still, the difference is easily ascertained, and upon examination with the finger, sound or speculum, the occlusion will be discovered at some point within the genital canal, and the history will show whether the menstruation had ever been present at all, and whether the existing atresia be acquired or congenital, and as pregnancy can only coexist with the former condition, the diagnosis will be cleared up by the presence of the probable or certain signs of gravidity.

Retroversion and retroflexion, retro-uterine hæmatocele, exudations, para- and peri-metritis, in so far as they cause hypertrophy of the uterus, lessening or cessation of the menses and other uncertain signs of pregnancy, have given rise to frequent errors. If the history be not neglected; if the position of the vaginal cervix, which is usually anteposed to quite an extent, its solid and firm consistence, together with the resistance of the tumor which may be felt from the vagina in Douglas' cul-de-sac, be carefully examined; if it be exactly ascertained by vaginal, abdominal and rectal examination that the tumor is confined to the uterus or extends over and to one side of it; and if, finally, after repeated exploration it be found that the remaining signs of pregnancy are wanting, or that the tumor remains unchanged or becomes smaller, or that suppuration is present (recognized by the fever and chills), there can be no doubt as to the condition present. The greatest difficulties are offered by those cases in which the uterus has risen to about the entrance to the pelvis or higher, in which there are but few of the uncertain signs and of the probable signs only the hyperæmia and enlargement of the organ, with, perhaps, slight hypertrophy of the breasts, and in which this condition remains unchanged for two or three months because of the death of the child. I have watched such a condition in both young and older people for two or three months, until finally they began to think I had been mistaken, when suddenly and quite rapidly the ovum with the dead fœtus was discharged.

As regards the mistaking of *large tumors* for pregnancy, this can only happen when careless, incomplete examinations have been made; but it should not be forgotten that even in the presence of the largest tumors (even as heavy as 50 kilograms), whether myomata or ovarian cysts, pregnancy may coëxist and run its course almost to term. Furthermore, the certain signs of pregnancy—such as feeling parts of the child, etc., owing to excessive distention of the uterus by twins, hydramnios, or a very rapidly growing hydatidiform mole—may be obscured for so long, or ascertained only by such extensive, very carefully repeated examination, that even the experienced physician should not be reproached if he make an error.

CHAPTER V.

Diagnosis Between Primipara and Multipara—The Determination of the Exact Period of Pregnancy, and the Size of the Child.

LITERATURE.

Hecker: *Monatsschrift*, XII, 401. Hueter: *Monatsschrift*, XIV, 33. Ahlfeld: *Archiv f. Gynäk.*, II, 237. Zweifel: *Archiv f. Gynäk.*, XXII, 491.

It is by no means easy *to distinguish a multipara from a primipara*, especially when the previous pregnancy took place many years before, for then the appearances are very similar. The striæ of pregnancy are not always present, but when they are, the older ones are pale and transversely folded upon themselves. Furthermore, in multiparæ the breasts are more pendulous, the nipple longer, and the abdomen less resistant. The frenulum is often absent, and between the entrance to the urethra and the head of the clitoris are usually found a number of pale linear scars; also, during pregnancy the external os opens as early as the middle of pregnancy, and the internal os four to six weeks before delivery. Moreover, the edges of the external os are notched, and this latter is the surest of all signs, but it may be absent when the previous child was small, and three or four years have elapsed since the last birth. With regard to internal appearances, when the vagina and vulva are roomy with numerous dilated veins, and when the cervix has been relaxed by a previous cervical catarrh and has become permeable, the primipara resembles the multipara very much, and the swollen and furrowed cervical mucous membrane very frequently causes puckering of the external os. In such cases, examination with the speculum will prevent mistakes. As a rule, the physician should also determine how far the pregnancy is advanced, and when delivery is to be expected. It is always well first to calculate the time according to the objective symptoms, as for instance, the position of the fundus, the size of the parts of the child which may be felt, the condition of the epigastrium and the position of the presenting part of the child; whether it has entered the pelvis, or whether ballottement may still be produced; whether the head is difficult to move or otherwise, and finally the amount of dilatation of both the external and internal os should be examined. Although the last-named sign is important in multiparæ in calculating the time of delivery, it should not be forgotten that in primiparæ also the cervix may open as early as 64 days, and in multiparæ 88 days before labor. It is true, in 62 per cent. of the primiparæ whose cervices are patulous, birth is liable to occur in the next few days, and in 72 per cent. of multiparæ in the next two weeks. However, as a rule, it is only in multiparæ that the finger may be passed through the internal os 28 to 42 days before delivery, and that it becomes larger and less resistant as labor approaches.

If the *day of conception* is known, *the date of delivery is calculated* by counting back three months from this date and adding seven days, as, for instance, April 7 : January 7 + 7 = the 14th of January. This makes 283 days, not 280; this date (January 14th) is only approximate, however. If the time of conception cannot be ascertained, the same calculation is made from the first day of *the last menstruation,* counting back 3 months and adding 7 days. If even this is not known, it is still possible to calculate the date from the time of quickening by adding 20 weeks in primiparæ, and 21 to 22 weeks in multiparæ. The surest way, however, is to depend upon the objective examination. Mattei, basing his opinion upon the hypothesis that labor occurs most frequently at the ninth catamenial epoch, proposed calculating nine times thirty days from the last menstruation (he does not say whether from the first day), even although the person in question formerly may not have menstruated regularly every thirty days.

As the length from the vertex to the breech is about half the length of the entire child, owing to its attitude and curvature in the uterus, its size may be approximately determined by measuring from over the symphysis to the fundus, or if the head has already engaged, by internal measurement with the pelvimeter. Errors are liable to occur, however, and even by exact measurement very little is attained, as the length of the child does not aid us in determining the size and solidity of the head. The diagnosis of the different presentations and the diagnosis of the death of the child in utero will be deferred until the description of the course of labor, in order to avoid repetition, especially as the recognition and appreciation of the fœtal heart in such conditions require a detailed consideration.

SECTION IV.

Multiple Pregnancy.

CHAPTER I.

Occurrence. Manner of Impregnation. Development of the Ovum.

LITERATURE.

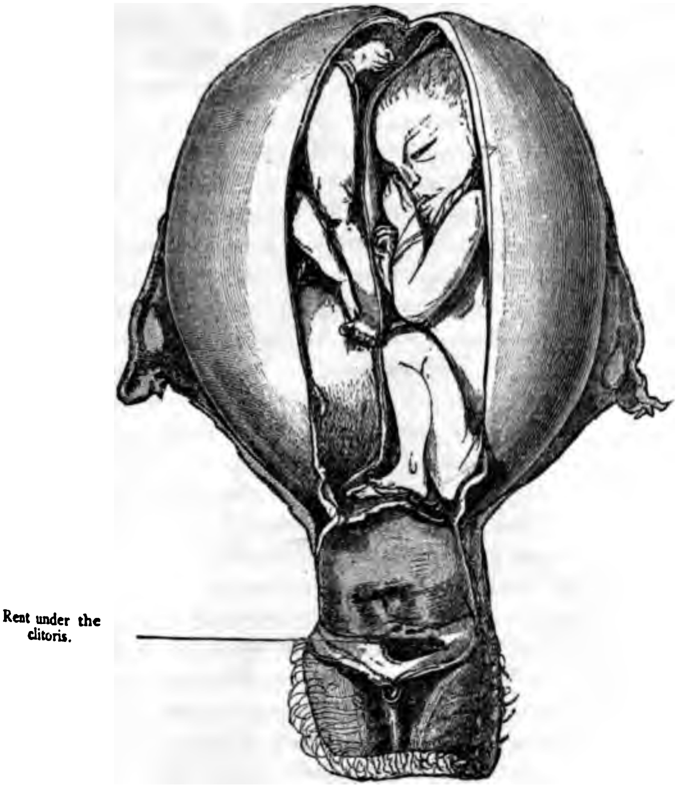
Krebs: *Monatsschr. f. Geburtskunde*, III, 236. Fleischer: *Monatsschr. f. Geburtsk.*, IX, 149. Galopin: *Monatsschr.*, XXXI, 475. Sproule: *Canstatt'scher Jahresbericht f.* 1867, II, 579. Veit, G.: *Monatsschr. f. Geburtsk.*, VI, 126. Ploss: *Monatsschr.*, XVII, 476. Späth: *Monatsschrift*, XVI, 311. Auvard: *Archives de Tocol.*, 1883, April. Kirch: *Centralbl. f. Gynäk.*, 1886, 774. Nagel: Verhandlung der Ges. für Geburtsh., 1846, I, 116. Beyer: *Casper's Wochenschr.*, 1840, p. 811. Bock: I. D. Marburg, 1855. Schatz: *Archiv f. Gynäk.*, XXVII *u.* XXX. Ahlfeld: *Archiv. f. Gynäk.*, VII, 210, 266; IX, 196; XI, 160. Budin: Comptes rendus de la soc. de biol, 1883, Nov. 11. Winckel: "Berichte u. Studien," I, 70, 299. Afonow: *Centralbl. für Gynäk.*, 1884, p. 541. Scharlau: *Monatsschrift f. Geburtsk.*, XXXII, 242. Credé: *Monatsschr. f. Geburtsk.*, XXX, 96.

Five is the greatest number of children that a woman may harbor in her uterus at the same time, for I am inclined to think the number six is fabulous, while, on the other hand, five have been born at once in several different countries. A specimen of this kind is found in the collection of the Rotunda Hospital, in Dublin, and another one in Hunter's Museum, in London, and furthermore such cases have been mentioned by Krebs, Fleischer, Galopin, Sproule, and recently by Poljakow, of Rjäsan.

The proportion of single to twin, triple and quadruple pregnancies in 13,208,868 births, extending over a period of twenty-four years in Prussia, is 88 to 1 for twins, 7820 to 1 for triplets, and 366,913 to 1 for quadruplets (*G. Veit*). Furthermore Ploss found from 1847 to 1856 the proportion to be almost exactly the same (87 : 1) as Veit for twins, but only found one case of triplets in 10,000, and only one of quadruple birth in 400,000, while Wappaeus in ten million births found 9,768,334 single, 227,597 twin, 3948 quadruple and 3 quintuple births, or more multiple births than were reported by Ploss and Veit. Auvard found in 13,532 births at the Maternité, in Paris, during nine years, 170 cases of twins, or 79 to 1. Considerable variations exist in the same race in different years. Bavaria, Ireland and Russia show the greatest number of twin births, France the smallest. Heredity has been proven, and the frequency of multiple pregnancy increases with the mother's age. As regards the number of follicles which have produced the ova, there are two possibilities: they are either derived from one follicle or from several. Furthermore each of these possibilities may be subdivided as follows: either the follicle contains two or more ova, or only one ovum, which undergoes division during the course of its development. When several corpora lutea vera appear, they may both be upon the same ovary or one on each side. *Impregnation of several ova* may follow a single cohabitation, but may also result from several repetitions of the act, as long as the cervix be not blocked by a plug of mucus, or the decidua vera adherent to the circumflexa. It may also take place in the uterus simplex as well as in the uterus septus, as is shown by the occurrence of ovulation during pregnancy (*Panum, Scanzoni*). Mayrhofer maintained that corpora lutea were found during the whole of pregnancy, at certain periods, perhaps monthly. We must acknowledge that *superfœtation*, by which is meant impregnation when a fœtus already lies within the uterus, in contradistinction to *superfecundation*, or conception in the presence of an embryo which has not yet become a fœtus, is quite possible, although not yet proven, when we take into consideration that the embryo is 13 to 16 mm. long at the end of the second month, and has already become a fœtus. What has most frequently led to this supposition is the fact that twins are seldom as strong as single children, and often differ in length, weight and cranial diameters, although the average difference in weight is only from 200 to 300 grams, but in four per cent. of the cases this increases to 900 to 1800 grams. The best proof, however, that these cases are not due to superfœtation is that in five-sevenths of the number there is but a single placenta (*Auvard*). Auvard himself once found the first child to be 35 cm. long and 750 grams in weight, and the second 43 cm. long and 1550 grams in weight, in a case where two different distinct lobes of the placenta, together with two amnions and two chorions were found. The length in twins is more constant than the weight.

It is quite interesting to note that in the recent quintuple birth (*Poljakow*, Rjäsan) the difference in the development of the children was very considerable, in spite of the fact that, although they had five amnions, there was but one placenta and one chorion, for although the first child was 41 cm. long, and weighed 934 gm., the others were only about 29 to 31 cm. long, and about 590 gm. in weight. On the other hand, the first child showed the initial symptoms of elephantiasis, and several fingers and toes were lacking. The differences in size noted by Kirch, of Florence, in a quintuple birth (three boys, two girls) were still greater, being as follows: (1) A boy, 1300 gm. 39 cm., shoulder presentation. (2) A boy, 1300 gm. 38 cm., shoulder presentation (two bags of waters were then felt in the pelvic inlet). (3) A girl, 940 gm. 24.2 cm., head presentation. (4) A girl, 1060 gm. 36.5 cm. (5) A boy, head presentation, 1240 gm. 37 cm. There was a large placenta for four of the children, with another for the fifth, connected with the first by fibrous tissue, and both weighing together 1120 grams. Only about one-third of all twins are carried to full term, the remainder being born prematurely. Their sex is usually the same, and with nearly equal frequency both are boys (32.68 per cent.) or both girls (30.6 per cent), or in about two-thirds of the whole number, while in 36.72 per cent. the sex differs. As a rule the proportion of boys to girls is about the same as in single births, or about 105 to 100. It has been maintained that three children is the greatest number that can be developed in the uterus at once up to the point of vitality, but Nagel's observation of a quadruple birth, in which the children weighed 9½ kgm. together (the first two children born lived a week), and a similar case of Beyer's, prove this to be false. Not infrequently one of the twins dies during pregnancy, while the other continues its growth until complete development is reached; the dead child, in the meantime, is more and more compressed, does not decompose, but, on the other hand, undergoes fatty degeneration, and is called *fœtus papyraceus*. It is, moreover, a remarkable fact that two of triplets may die without interfering with the complete development of the remaining child (*Bock*). Many twins, especially when of the same sex, are astonishingly like each other, not only in body and features, but also in constitution and temperament, while those of unlike sexes are apt to be very different in every way. As regards the *placentæ* of twins, in 506 cases they were recognized 444 times as having been derived from two ova, and 62 times from one ovum only (7 to 1). Whether the placenta originates from one ovum or from two, it may be common to both; as, indeed, seems to be usually the case. Two chorions and two amnions (Fig. 27), or only one of each, may be present. In the former case four layers are distinguished in the wall separating the two children. This obtains most frequently ($\frac{1}{7}$), while one chorion is rarer, and rarer still, one amnion ($\frac{1}{68}$—*Späth*). Where the placentæ are separate, a layer of decidua is always found between the chorions of the ova. Where there are two chorions, the fœtal placental vessels are entirely separate from each other or only connected by unimportant anastomoses. Where the placentæ are adherent, another decidua is found between the two chorions, so that both ova must have been first enveloped in the circumflexa before the placentæ came together. According to Schatz, in almost all cases of twins and triplets derived from one ovum, there exist along the borders of the adjacent placental circulations a number of villous systems, whose vessels are common to both of these, inasmuch as one furnished the arteries and the other the corresponding vein. A number of these villous systems carry the entering blood from one villus to the other, and then it is returned again from this to the first one, so that in such cases (twins and triplets from one ovum) a third placental circulation exists which is common to both of the twins and passes through both hearts. The quantity of the blood in this third circulation amounts to only about the tenth or twentieth part of the entire current, or it may be still smaller, but in rarer cases it may even rise to one-fifth. This part of the placental circulation in most twins is usually supplemented or compensated for by a single (rarely double) superficial arterial and often a venous anastomosis as well. Deep anastomoses, as Hyrtl reports, are not present. The difference in the extent of the current of this third circulation gives rise to a dynamic asymmetry, which is often not fully compensated for by anastomoses, and must therefore lead to corresponding compensatory functional changes in the bodies of the twins.

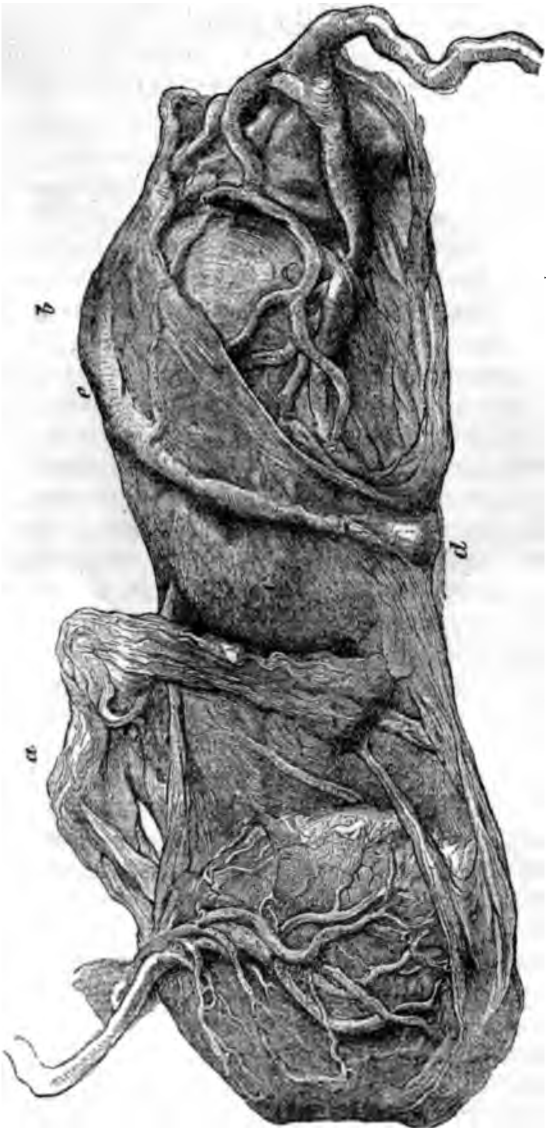
FIG. 27.



The genitals of a pregnant woman who died of hemorrhage from a rent under the clitoris. Uterus containing twins. I. In the first breech position, 2350 gm. II. Head presentation, 2600 gm. Tenth month. Length of the uterus, 38 cm.; 29.5 cm. wide. Long circumference 106 cm. Transverse circumference 71 cm. Quantity of liquor amnii, 820 c.cm. Two amnions and two chorions. One-fifth natural size.

Where only one amnion is present in twins, the amniotic folds have either united, on account of the lack of space (traces of which union may be visible), or else the twins have been derived from one ovum. The umbilical vessels of both ova are sometimes combined into one at first, dividing subsequently into two. Inflammation or erosion (*Ahlfeld*) of one of the membranes, and subsequent disappearance of the septum, may also lead to union of the two amniotic cavities. The shape of the twin placenta (Fig. 28) is just as liable to variation as that of the simple one, and

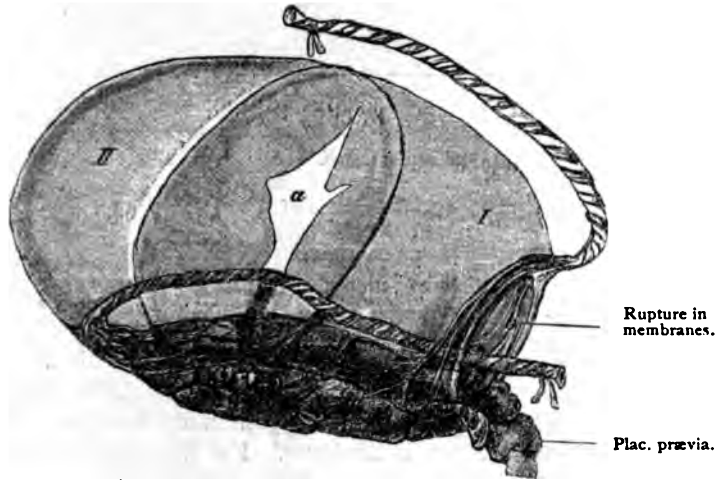
FIG. 28.



Twin placenta. The membranes of placenta (*a*) have passed over to those of placenta (*b*), and cover the surface (*c*) as far as (*d e*). Two-thirds natural size.

cysts, calcareous deposits, double borders or fibrous membranes may make their appearance. A not infrequent change, which is very interesting, is the encroachment of the amnion and chorion of one ovum upon a considerable portion of the fœtal surface of the other placenta—*representing, in short, a kind of intra-uterine struggle for existence*. According to Budin, in twins the ova either lie side by side, one over the other, or one in front of the other—the first-named being the most frequent position. Budin was the first to describe the second condition, but it is said to be not infrequent, and is recognized after birth from the fact that the second child passes through an opening in the septum separating the two. I observed a case of this kind in a placenta prævia occurring in May, 1887. (See Fig. 29).

FIG. 29.



Placenta prævia lateralis. Twins from one ovum. Insertio velamentosa duplex. Twins lay one above the other. I below, II above. (*a*) The rent in the membranes of No. II, (*b*) the rent in the membranes of No. I. Two amnions. One-fifth natural size.

Triple pregnancy should be regarded as a combination of twin and single pregnancy. They may have but one chorion and even only one amnion, and in this case are derived from a single ovum. Two such cases have been published by Credé and the author. Furthermore, triplets may develop from *two* ova, and one or two placentæ may then be present; but two of the children are found in one chorion—in short, there are but two chorions (Afonow's cases and others). Finally, triplets may originate from *three ova*, and each child may have its own placenta, and must have its chorion and its amnion (Scharlau's case). The triplets described by Afonow, Wolczynski and Menzel all lived. *Quadruplets* are to be regarded as double twins, or as a combination of triplets and a single child. In Poljakow's case of *quintuplets* there was a common placenta, with five amniotic membranes, and each funis was peripherally inserted. In Nagel's case (four children) two double placentæ were present, and in Beyer's case one double and one single. In twins the insertion of the cord is often symmetrical, that is to say, central or lateral for both; the velamentous insertion is also found very frequently, as before mentioned, in both of the twins, as is seen in Fig. 29. (In my case of triplets, the insertion of two of the cords was velamentous and of one marginal.)

In such cases it is inferred that one of the twins prevents the approach of the allantois to that part of the chorion which directly connects the ovum with the mucous membrane of the uterus. The quantity of amniotic fluid of each twin may be as great as that of single children; in the case illustrated by Fig. 27 its amount was 820 c.cm. Varying quantities of liquor amnii in twins will be discussed hereafter.

CHAPTER II.

Symptomatology and Diagnosis of Twin Pregnancy.

LITERATURE.

B. S. Schultze: *Monatsschr. f. Geburtsk.*, XI, 355. (Illustration.) Künecke: I. D. Göttingen, 1861.

The phenomena which are caused by the presence of several children in the uterus are often not essentially different from those of single pregnancy, except that the symptoms of pressure and congestion are more marked at an earlier period in the former than in the latter. For this reason œdema and varicose veins of the lower extremities and phlebectasia and œdema of the vulva, as well as œdema of the striæ (which gives them an appearance resembling a string of beads), are more frequent than otherwise. The abdomen, especially at its upper part, is more distended, thereby increasing the distance from the navel to the xiphoid process. In consequence of this greater tension the gravid woman has more subjective symptoms, as frequency of micturition, greater muscular pains, greater tendency to dyspnœa and more difficult locomotion. The so-called *kidney of pregnancy* is more often present in multiple pregnancy, and the ureters are more dilated, so that there is a predisposition to eclampsia. As mentioned in the chapter upon the development of the child, the duration of pregnancy is usually shorter—sometimes by a couple of weeks—than in simple cases. This shortening may be due to the fact that the great distention of the uterus causes the external and internal orifices of the uterus to dilate at an earlier period, and the membranes thus insinuate themselves more easily into the cervix when the woman moves, and thus force it open sooner than usual. The same effect may also be produced by the greater pressure symptoms, the kidney of pregnancy, and the œdema. On the other hand, there are cases in which the uterine contents weigh twice as much as in simple cases, and notwithstanding this, neither extreme œdema, varicosities nor distention of the ureters are present, the duration of gestation is 280 days, and labor takes place in the usual way. This is the case in vigorous multiparæ, with fairly non-resistant abdominal and uterine walls. We have said that the certain signs of pregnancy in single cases are solely and entirely referable to the child, and this applies with even greater force to twins. All the signs which proceed from the mother are uncertain as far as the existence of the second child is concerned. Among these may be mentioned the œdema and the furrow in the abdomen which may be also produced by an abnormal shape of the uterus, or by great retraction of the ring of contraction during labor, or, furthermore, by the interposition of the bladder and intestines between the uterus and the walls of the abdomen. The phenomena produced by twins may be simulated by unusual distention of the uterus, due to very large children or an excessive amount of liquor amnii, as well as by tumors near or in the gravid uterus, especially myomata and rapidly-growing ovarian cysts. Early shortening of the cervix is an uncertain sign. It is true that the lower uterine segment in twins is often very much thinned at an early date, with marked projection into the fornix of the vagina, but this is by no means always the case, and depends upon the position and nature of the presenting part. The vaginal cervix, when no part of the child has entered the true pelvis, may even be higher than usual. On the other hand, the body of the child gives us such a series of sure indications that a positive diagnosis of twin pregnancy may be made in the majority of cases, if a complete and careful examination confirm *each* of the following signs, but not otherwise. The signs are:—

1. The feeling of similar parts at both the cervix and the fundus, or the discovery of two bags of waters at the cervix (*Pinzani*, *Kirch*, *F. Winckel**); and, above all, when two or three heads (as in Afonow's case of triplets) are present; feeling four extremities is also a sure sign; B. S. Schultze, for instance, found five in the vagina.

2. When two or three pairs of heart-sounds of the same strength and frequency are heard, at some distance from each other, at almost the same level on the left side, or above on one side and below on the other. I recently made the diagnosis of twins in the clinic, basing my opinion upon this symptom, and also upon similarity of the cardiac pulsations, and Afonow made the diagnosis of triplets in the same manner.

3. The discovery of two pairs of cardiac sounds which are positively *dif-*

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* Dresden, 1883. No. 387.

ferent in *frequency*, and not confounded with the maternal pulse; for instance, 132 at one point and 144 at another, is also a very sure sign when they have been confirmed by different observers, as we can testify from our own experience in several cases. Küneke's double stethoscope, invented specially for this purpose, is not necessary in such cases.

4. Another certain, but very rare sign, is the hearing of the cardiac sounds, or feeling the movements of one child at the same time that we are able to make out signs of death in the other, such as feeling the pulseless cord, or the loose and movable cranial bones, or detached epidermis.

5. Finally, another reliable sign is the absence of motion in the upper portions of the child when the presenting part is moved about. The difficulty of diagnosis, and the mistakes which occur, are due to the neglect to establish firmly the existence of at least one of the above-mentioned signs. Furthermore, owing to the position of the child, as, for instance, when the back is behind, it is often impossible to hear the heart-sounds and difficult to feel parts of the fœtus; and not only this, but palpation and auscultation are interfered with by the marked distention of the abdomen and great tension and œdema of the abdominal walls, so that it is also difficult to hear conveniently at all points with the stethoscope. It should not be neglected to ask the gravid woman if she, or her mother, or her sisters have ever borne twins, for as we know, twin births often recur in the same person or family. My father reported the case of a woman suffering from osteomalacia who bore twins twice in succession, and followed this up with triplets. It is difficult to calculate the duration of twin pregnancy, on account of the greater distention of the abdomen; but still, even if one does predict a too early date, it is rather an advantage, for the delivery will probably occur earlier than usual in the majority of cases.

SECTION V.

The Management of Pregnancy.

CHAPTER I.

Nourishment. Clothing. Bodily and Mental Occupation. Care of the Skin. Preparation of the Genitals for Labor and the Puerperal State.

F. A. von Ammon's book upon the advice to be given to the pregnant woman, especially as to the duties of the young mother, and the first care of the child, the preparation for labor, diet, clothing, etc., is an excellent work upon the subject. The first question the woman asks is usually regarding the diet, owing to the nausea and vomiting present. The *quantity* of nourishment should be moderate and divided up into a greater number of meals. The food should not be too rich, although not lacking in *quality*. Caprices should not be tolerated, and highly spiced dishes are to be avoided as much as possible.

Strong alcoholic drinks should not be allowed, but the constitution and habits of the individual should not be disregarded, as those who are accustomed to strong wines and beers might suffer from loss of appetite were they deprived of them. Furthermore some persons, washerwomen for instance, can often consume considerable quantities of alcohol without harm to the child. They should be warned against the ingestion of foods which do not agree with them ordinarily, by causing a sense of oppression in the stomach, heartburn, or nausea and vomiting, headache, cardialgia, diarrhœa or constipation. Furthermore they should be advised to avoid such foods as, although they formerly caused no inconvenience, now give rise to any of the abovementioned symptoms. The gravid woman must watch herself and shape her mode of life according to circumstances, continuing her ordinary diet as long as she finds it agrees with her. The marked development of the entire cutaneous vascular system, the increase in the size of the breasts and abdomen, the displacement of certain organs, and change in the form of the thorax, make certain changes in the *clothing* quite necessary. Sudden chilling or any constriction of the body which would lead to interference with the respiration and circulation of the mother and the growth of the fœtal or maternal parts, are to be avoided. The too sudden chilling of the external genitals and adjacent parts is most apt to occur, and for this reason the patient should be advised to wear under flannels in winter, and to expose her neck and chest as little as possible. Tight garters are also injurious, and vertical supporters should be preferred, which may be fastened to the corset or to a girdle around the waist, and the sooner this is done the less danger there is of varicose veins. As soon as the abdomen begins to swell, the tight flat *corset* should be discarded, and one more roomy substituted in its place. Very appropriate corsets are those whose lower edge consists of an elastic band which reaches down to the mons veneris, with convenient support for the breasts, thus avoiding pressure upon the nipple. Dresses which are tight around the waist must be prohibited, and when the above variety of corset is not to be had, a well-fitting one of flannel or linen may be substituted, provided with a good *abdominal band*. This protects the abdomen from cold, supports the uterus, and prevents it from hanging down too much, and furthermore facilitates movement. It should extend from the mons veneris to the epigastrium, and be laced up in front and in the back, so that it may be loosened or tightened according to circumstances. The *skin* requires especial care. The usual ablutions should be continued, but the cold douche and excessive rubbing and violent movements are to be avoided. Cold foot and sea baths are often tolerated by women who do not suspect their condition, but at the same time it is injudicious to recommend them or permit of their general use. On the other hand, one or two weekly warm baths of from 90° to 95° F. may be taken with proper precautions, and during the last six or eight weeks they may be indulged in with advantage, especially by primiparæ, three or four times weekly. Where it is not convenient to take a warm full bath, frequent washings of the feet, extremities, body and head with warm water and soap, should be recommended, but sitz-baths are to be avoided. Owing to the changed condition of the skin, there is a greater liability to the settlement of deleterious matter, especially fungi, from the air, thus causing disagreeable odors, so that it is wise to advise the patient to wash these parts with a mild soap, and then to rub in a small quantity of spirits of some kind. These rules apply more particularly to the vulva and breasts. Chafing in the groin and under the breasts may be avoided by washing these parts at least twice daily with water to which salicylic or carbolic acid (1:1000) or a little vinegar has been added. If excoriations are caused upon the nates by an irritating discharge from the vagina, this must be combated by injections. The water used should not be too cold, but may be cool.

The *breasts* should be freely washed with soap daily, and the *nipples* prepared for lactation, during the last three months, by pulling them forward every morning, removing crusts from them, and washing them with cold water, or they may be rubbed with rum, brandy, claret or a decoction of oak bark, allowing the liquid to penetrate into all depressions. If they are flat or tend to recede, an india-rubber ring or shield may be attached to the base, so as to hold the nipple forward for a certain time; no pain or inconvenience, however, should be caused by these manipulations. As a rule, the *occupation*, *exercise* and *sleep* should be the same as before. Dancing, riding, jumping, climbing up steep mountains, going up long flights of stairs frequently, however, must be forbidden, especially in anæmic people who easily acquire palpitation of the heart. Furthermore, jolting over a rough road, moving heavy furniture, frequent stooping, turning a wheel, massage, or the continuous use of the sewing machine—all these are active and passive movements which are likewise contraindicated, but are often carried on by the poorer classes without injury.

It is advisable to arrange for frequent *changes* from mental to physical activity, especially when the patient shows a tendency to melancholia or laziness and languor. Daily exercise in the open air should be advised. Walks of from an hour to an hour and a half daily, or short trips on the railroad of from four to six hours, may be taken with impunity and are a benefit to those who are otherwise healthy and have always experienced normal deliveries.

Crowded churches, theatres, concerts, and balls should not be visited. The pregnant woman requires eight hours of sleep, like all other people; a noonday nap is not necessary. The sleeping room should be roomy, sunny and well ventilated. Mental excitement of all kinds should be avoided, such as anxiety and fear concerning the dangers of the approaching labor.

CHAPTER II.

Antiseptic Precautions as a Preparation for Labor.

In order to avoid the occurrence of *puerperal fever*, the gravid woman is entirely dependent upon her physician. He should prescribe some fluid carbolic acid and some tablets of corrosive sublimate, which she should be instructed to keep in readiness, not forgetting to warn her of their poisonous character. Furthermore, she should be warned not to allow herself to be examined by a nurse, either internally or externally, unless this person shall have previously washed her hands and arms with a three-per-cent. solution of carbolic acid or a one-tenth-per-cent. solution of corrosive sublimate, and carefully cleaned her nails with a nail brush. The patient herself should first wash the external parts with a three-per-cent. carbolic solution, and dry with salicylated cotton, and it is a good plan also to have the midwife inject a couple of pints of a three-per-cent. carbolic solution into the vagina. When these precautions are taken, there is no danger of infection. If there be no purulent discharge from the vagina, there is really no need of the injection. The pregnant woman should, furthermore, provide herself with a new elastic catheter, a basin and irrigator, several glass douche nozzles and short and long rectal tubes, and she should be instructed in the use of these instruments. She should never allow the nurse to employ sponges or instruments which have already been used. Furthermore, the physician must decide whether the mother will be able to nurse her child after confinement. Every mother who is healthy, and whose nipples may be grasped fairly well, should be urged to nurse her child, even though the secretion may seem to be very small in quantity at first. *Ubi irritatio ibi affluxus.* Epileptics, consumptives, very anæmic people, or those who suffer from chronic skin disease or other hereditary taint, should *not be allowed* to nurse. Those in whom depression of the nipple is marked, and those who show traces of previous mastitis and suppuration during lactation (cicatrices), should also be prevented from nursing their children. This question of nursing should come up for decision before birth, so that a good wet-nurse may be engaged in time, or a nurse provided who understands artificial nourishment. In the latter case good milk must be contracted for and the necessary apparatus provided for before the birth—one or two bottles, nipples, warming apparatus, etc.—or, what is better still, Dr. Soxhlet's arrangement, which will be referred to later on.

CHAPTER III.

The Treatment of the Milder Disorders of Pregnancy.

LITERATURE.

Hauck: "Geburtshülfl. Praxis." Berlin, 1855.

It was formerly believed that the serous plethora was the cause of all the disorders of pregnancy, and these were accordingly treated by *venesection* as late as 1850, which was even repeated every week in pathological cases (*Hauck*). Others gave *cathartics*, as though it were necessary to remove some particularly deleterious influence from the body. Nowadays, when the above-mentioned disorders become especially annoying, our efforts are limited at first to the regulation of the diet, and if this does not succeed, to the employment of the milder remedies. Venesection during pregnancy has been abandoned for almost an age.

In *frequent micturition, dysuria,* and dribbling of the urine, we recommend avoidance of an excess of fluids, of diuretic solids or liquids, such as asparagus, parsley, strong tea or coffee, and beer; the patient should also be instructed to empty her bladder before taking exercise. Carbonated drinks, Apollinaris, Giesshübler, soda and Seltzer water, and Weiss beer often do good. Warm stockings and under garments, a good uterine bandage, and the so-called catamenial bandage, which keeps up an even pressure on the vulva, are the best means for combating this condition during the later stages. If there is marked obstruction, then extract of hyoscyamus in an emulsion of almonds may be given (1.5 : 150), or two or three drops of the tincture of thebaïca several times daily.

The *morning sickness* may be mitigated and arrested by giving the woman a little fluid food before getting out of bed in the morning. Furthermore all dishes should be avoided which cause vomiting and regurgitation; very little should be eaten at one time, and rapid motion avoided if possible; moreover a good abdominal bandage should be applied, and regular movements of the bowels must be secured as well as an abundance of exercise in the open air. If these measures do not succeed, all foods apt to cause flatulency are to be forbidden, the diet restricted considerably for several days, and finally a small mustard plaster about the size of the hand may be applied to the epigastrium, and rest in bed advised. This will probably have the desired effect. In *constipation* the best measure is a high injection every day of about a pint to two quarts of water, and if this does not succeed, castor oil per rectum or mouth (in capsules), magnesia lemonade, compound rhubarb powder, pulv. glycyrrhiz. co., or laxative teas may be used (cortex rhamni frangulæ with radix graminis), the dose of any of which is about a half to a whole teaspoonful. Failing with these, the bitter waters are next in order, in doses from two tablespoonfuls to a wineglassful. Strong laxatives and drastics should be avoided unless the woman is seriously ill, as the cathartic action may be transmitted to the child.

If the *varicose veins* and *œdema* become painful, the applications of lead water may bring relief, and having dispelled the pain, bandages and eventually elastic stockings may be applied. Marked varicosities may be controlled by compression with adhesive plaster, or, in regions like the groin and mons veneris, by the application of the ordinary truss. The patient should be cautioned, in case of rupture of the veins, to apply the finger to the bleeding point until help is at hand. The tendency to *vertigo* and *fainting* in the anæmic subject should be combated by good diet, while in the full-blooded mild catharsis and plenty of exercise should be advised; the garments should be loose and the bowels regular. During the attack itself, the patient should be put in the horizontal position and the clothing loosened, at the same time admitting fresh air to the room and sprinkling the patient with water and applying smelling salts to the nose. Tea and coffee, beer or wine, a few drops of Hoffmann's anodyne may be given, or a mustard plaster may be applied to the epigastrium, but it must be remembered that this must not be carried to excess, as it might be followed by untoward complications. The *pain* caused by the traction of the muscles at the costal arch and in the epigastrium may be relieved by lying down the upper portion of the body being elevated, and friction with volatile liniments and tinctura thebaïca (three parts to one), or chloroform and ol. hyoscyami (one part to three), or morphine and lanolin. The remaining *neuralgias, toothache, headache, pains in the neck and back* also may be mitigated by remedies of a like nature. The *ether spray* is very good in faceache, and laughing gas and cocaine may also be used. The patient should avoid having healthy teeth removed. The specifics, like quinine, veratrine, morphine, Fowler's solution, chloroform and chloral hydrate are only permissible in violent typical attacks, and in such an emergency the first and last-named remedies are the most effective and least harmful to the pregnant woman. *Pityriasis versicolor* is best treated by *persistent washing* of the parts with 1 : 2000 corrosive sublimate solution. The clothing should also be washed with this solution, and frequent warm baths should be taken.

PART II.

PHYSIOLOGY AND MANAGEMENT OF LABOR.

CHAPTER I.

Definition. Motor Nerve Centre of the Uterus. Causes of Labor.

LITERATURE.

Conrad: *Centralbl. f. Gynäk.*, 1884, No. 34, 535. Dembo: *Gazette des hôpitaux*, Nr. 3, 1883. Frankenhäuser: "Die Nerven der Gebärmutter." Jena 1867. Frommel: *Zeitschrift f. Geburtsh. und Gynäk.*, 1882, VIII. Geyl: *Archiv f. Gynäk.*, XVII, 1. Hasse: *Zeitschrift f. Gynäk. und Geburtsh.*, VI, 1, 1881. Kehrer: "Beiträge zur experimentellen Geburtsk.," I, p. 30, 31, and also "Physiologie der Geburt des Menschen u. der Säugethiere." Giessen, 1867. Kurz: *Centralbl. f. Gynäk.*, VII, 681. Leaman s. Parvin: *loc. cit.*, p. 338. Leopold: *Archiv f. Gynäk.*, XI, 499. Litzmann: "Schwangerschaft" in Wagner's Handwörterbuch der Physiologie, III, 1, 107. Parvin: "The Science and Art of Obstetrics." Phila., 1886, p. 338. Poullet: *Archives de Tocologie*, 1880. Runge: *Zeitschr. f. Geburtshülfe u. Gynäk.*, IV, 75. Runge M.: *Centralbl. f. Gynäk.*, 1883, Nr. 21, 329. Spiegelberg: "Zeitschr. f. rationelle Medicin." 1858. 3. Reihe, II. 1. *Monatsschr. f. Geburtsk.*, XXIV, 11. Veit, G.: Verhandlungen der Gesellschaft f. Geburtsh. in Berlin, Heft VII, 1853, p. 122.

Labor is the process which severs the connection between the mother and the ovum, and removes the latter from her organism. According to its course and termination, labor is said to be regular or normal (eutocia) when neither mother nor child sustain any noteworthy serious injury, and irregular or abnormal (dystocia), when the mother or child, or both, are injured in some way by the influence of this process. According to the time of pregnancy at which labor takes place, it is designated: as *abortion* when it occurs within the first sixteen weeks, *i. e.*, before the completion of the placenta. It is known as "*partus immaturus*," or immature delivery, when it happens from the sixteenth to the twenty-eighth week, *i. e.*, before the child is viable; and finally, a labor occurring from the twenty-eighth to the thirty-eighth week, *i. e.*, after the earliest period of viability, but before maturity, is called "*partus præmaturus*," or premature delivery. Labor at term, from the thirty-eighth to the forty-first week, is designated "*partus maturus*," while "*partus serotinus*" indicates that the child has remained in the uterus longer than forty-one weeks. This division is not only justified by the development of the child, but the symptomatology is also different, as we shall see later.

For a long time the demonstration of the *motor nerves of the uterus* has been the subject of experiment, but satisfactory results have not yet been obtained. A centre of motion for the uterus exists, beyond a doubt, in the medulla, from which the impulses pass down through the cord and sacral nerves to the uterus. Some, also, undoubtedly pass by central fibres in the path of the plexus aorticus. This network of fibres, which is derived from the superior mesenteric plexus, unites with branches from the spermatic and lumbar ganglia of the sympathetic to form the plexus uterinus magnus at the bifurcation of the aorta. This plexus uterinus magnus divides, 4 cm. lower, into two portions, forming the plexus hypogastrici, which receive numerous filaments from the lower lumbar and upper sacral ganglia of the sympathetic, and pass right and left about the rectum, and then divide into smaller portions, which pass to the posterior and lateral uterine surfaces, and larger portions, which are joined by two, three or four of the sacral nerves before they reach the cervical ganglion.

This *cervical ganglion* is an extensive plexus lying upon the posterior vaginal fornix, and supplies the entire uterus, but especially the cervix, with nerve filaments. Impulses to the uterus are sent out from the above-mentioned centre situated in the medulla, and are transmitted to the uterus by the vasomotor tracts, or else they follow the motor tracts. Frankenhäuser believes that the plexus sympathici hypogastricus is the motor nerve centre of the uterus, and that its ganglia are the rendezvous for motor impulses, while stimulation of the nerves passing from the sacrum to the uterus interferes with contraction, and that therefore these latter should be regarded as inhibitory nerves. Kehrer, on the other hand, while he did not succeed in causing contractions by irritation of the plexus hypogastricus magnus, was successful in this respect upon irritation of the sacral branches of the superior hypogastric plexus and the internal spermatic nerves, and for this reason tried to establish the central influence in the cord or brain. More recently Dembo declared that this centre is found in the peritoneal coat of the uterus or between this and the muscular layer, and strengthened this view partly by experiments with electrodes, and partly by the demonstration of numerous ganglia at that point. This view would seem to be confirmed, also, by a series of facts which indicate that the uterus is independent of the spinal centres, for stimuli that are applied directly to the nerves and ganglia of the uterine walls also cause contractions. For instance, it has been established that chemical, thermal, mechanical, and electrical stimuli applied directly to the uterus cause not only a decrease of the supply of oxygenated blood, and stimulate different parts of the nervous system, such as the cerebellum, the medulla, the lumbar region of the cord and sympathetic ganglia, but also give rise to contractions of the uterus, which, however, may also be excited by reflex action through the skin, the mucous membrane or the central ends of the nerves. Dembo furthermore claims to have found *groups of* *ganglionic cells in the upper part of the anterior vaginal wall,* which he believes to be the centre for uterine contractions. Kurz thinks he has confirmed the existence of the vaginal ganglia; but this statement of Dembo's needs still further confirmation.

It may, however, readily be understood, from these different statements, that the uterus may be excited to contraction by the *most varied peripheral and central influences.* We have already mentioned that there is a gradual transition from the contractions of the uterus, which occur so often during the last months of pregnancy, to the contractions of labor without any very sharp demarcation; the latter being simply the culmination of the former. This increase usually takes place at about the same time, approximately, in the same, as well as in different, women, and for this reason, for a long time past, there has been a tendency to connect the cause of this increase with *the causes of labor.* It was thought that these were found in either the mother or the child, or in both. In view of the extremely dense network of nerve fibres surrounding the uterus, it is not likely that its contractions are effected by only one of these influences; it is therefore to be supposed, a priori, that this process, like others, not only *has more than one cause,* but is the sum of several, and these may furthermore enter into different combinations to accomplish the same result. The most ancient explanation was that the fœtus, like the chicken and butterfly, when the uterus got too small for it, broke through the membranes and worked its way out: *fœtus se ipsum parit* (*Hippocrates, Harvey*). Fabricius maintained that the weight of the head lying upon the cervix forced it open by means of its pressure. Others believed that a colic was caused by the distention of the intestines with meconium (*Drèlincourt*), or discomfort occasioned by distention of the bladder. Still other observers contended that the liquor amnii became irritating to the skin of the child, or that it was too warm, and finally the *narrowing of the ductus arteriosus Botalli,* the ductus venosus Arantii, and foramen ovale was thought to cause more energetic movements of the child, and thereby contractions of the uterus. With regard to *the uterus* itself, it was thought at first that the cause of labor was the severance of the connection between the fœtal vessels and the walls of the uterus (*Rhazes*). Naegele, Sr., also thought that at the end of pregnancy the child acted as a foreign body which must be expelled from the uterus. On the other hand, others contended that the uterus was capable of a certain amount of distention and no more, and that when this point was reached, it reacted on the fœtus with contractions. Power (1819), and Dubois and Depaul after him, were the first to ascribe labor to the inevitable distention, stretching and opening of the internal os, by which the fundus was excited to contraction, just as a desire to urinate or to go to stool is caused when the bladder or rectum is to be emptied. Another group of authors, as Stark, Mende, Hohl, and many others, concluded that it was the tenth period of menstruation, with its accompanying *irritation of the ovaries* and consequent *hyperæmia of the uterine walls*, that led to contractions. Spiegelberg also formerly believed in the theory of unequal distribution of the blood in the uterus, but later on he thought that the cause was not to be sought in the uterus, but in the child, and that at its maturity certain substances which hitherto had been utilized by the fœtus, now accumulated in the maternal blood, and were transmitted again to the fœtus, but being no longer accepted by it, were thus set free in the mother's blood, and acted as chemical stimuli in exciting the activity of the motor centres of the uterus. In support of this was the period of time which sometimes elapses between the birth of twins; the continued growth of one child after the birth of the other; the death of the extra-uterine mature child and the occurrence of contractions in the empty uterus in cases of extra-uterine pregnancy. Brown-Séquard had already demonstrated that carbon dioxide in excess in the blood of the pregnant animal excited contractions of the uterus, and this observation was supplemented by Hasse, who declared that the timely commencement of labor was dependent upon the influence of certain ingredients (CO_2 above all) contained in the placental blood on the central nervous apparatus of the uterine muscle.

Finally, according to Leopold and Ruge, the spontaneous occurrence of *thrombosis in the veins of the placenta* in the last months causes venous hyperæmia of the placenta, an excessive saturation of the blood with CO_2, or rather a lack of oxygen in the uterine walls, and hence the subsequent contractions. I believe that all these are merely *predisposing* causes, whose influence extends more or less over the whole course of pregnancy, like the fatty degeneration of the decidua, the calcareous deposits in the decidua and villi, and the movements of the child; these latter, for instance, may be absent or so weak as to be without effect, as in delicate, diseased or dead children, and nevertheless labor takes place. The opening of the internal os is merely a predisposing cause, for months may elapse from the time it gapes until the beginning of labor (in some cases 80 days). The uterus is furthermore predisposed to contraction by congestion, but it cannot be proven that the tenth menstrual congestion is a direct cause, since ovulation usually ceases; furthermore, labor takes place after both unilateral and bilateral ovariotomy. It is also improbable that an irritation which is too weak to effect ovulation, should excite the uterus to contraction (*Parvin*). In short, it is apparent from all this that the occurrence of labor is not due to one specific cause, but to a combination of different and sometimes accidental influences. The increase of the contractions of pregnancy to the pains of labor is accomplished in different persons in different ways, according to their susceptibility to irritation; the higher the degree of this susceptibility, the earlier and more effective the "pains."

In general, labor occurs at a fixed date after impregnation, but this may be explained by the presence at this period of *all* the above predisposing causes: the size and distention of the uterus, the developed ability to contraction, the more marked movements of the child which is in a more intimate relation with the walls of the uterus; the less intimate relation of the membranes with the uterine walls, the gaping cervix, etc.

Hence it is obvious that even an unimportant—perhaps accidental—occurrence, such as slight pressure by the abdominal muscles or intestines upon the uterus in walking, climbing, stooping, coughing, or straining at stool or during micturition, as well as any psychical irritation (anxiety, care, expectation, fear or anger), may suffice to excite the true pains of labor.

CHAPTER II.

The Expelling Forces.

LITERATURE.

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In order to insure the normal termination of labor, the forces which preside over expulsion must be in just proportion to the resistance offered, that is, they must overcome the resistance, and at the same time not be excessive. The expellent forces are the contraction of the uterus, vagina, and floor of the pelvis, and the pressure of the abdominal muscles and diaphragm.

1. *The Contractions of the Uterus, or "Pains" (Dolores).*—The uterine contractions are called "labor pains," because they are painful. They do not begin all over the uterus at once, affecting the uterus symmetrically, but creep over the organ gradually, like a *peristaltic* wave, but so quickly that the whole uterus is contracted in a few seconds. They are involuntary and cannot be controlled by the patient nor quickened by her, although she may contribute to their force. Still, they are under the influence of the brain, and may be interfered with or even arrested by sudden fright or great excitement. It is not positively known whether the contraction begins at the fundus and passes thence to the cervix, or vice versa. Kehrer found the latter to be the case in the rabbit, so that the onset would be antiperistaltic. Spiegelberg thought the fundus was the starting-point, while Cohnstein maintained

that the contraction takes place simultaneously in all parts of the uterus. Schatz asserted that (as in animals) it passes from the tubal ends toward the cervix, which is no doubt the most likely hypothesis. The pains recur at certain intervals, and are quite typical. The intervals between the pains or *pauses* usually correspond to the variations in the pains as regards their length and regularity. A fully developed pain may be divided into several *stages:* namely, the *stadium incrementi,* when the uterus begins to harden and to rise toward the abdominal walls, as is evident to the sight and touch; it becomes more slender and more prominent anteriorly, its muscular fasciculi more conspicuous, its transverse diameter less, while length and thickness increase. Usually the onset of the pain is much more rapid than its decline; the latter may equal the former, but is seldom more abrupt (*Schatz*). During this stage the woman has an uncomfortable feeling, but sometimes is not conscious that the "pain" has begun, until the *stadium acmes* is reached, when the uterus attains a symmetrical degree of hardness, and can no longer be indented by the hand, at which time a gradually increasing pain is complained of. The *stadium decrementi* follows this, the contracted uterus relaxes and may be indented by the hand, the suffering decreases and finally disappears, although the height of the contraction may be supplemented by a slight secondary hardening.

The duration of the different stages varies according to the progress of the labor, but usually the acme of the pain is considerably longer than the two other stages, and the *stadium incrementi* somewhat longer than the *stadium decrementi.* The pain, as a whole, lasts from 60 to 90 seconds, and the peristaltic action from 20 to 30 seconds (*Schatz*). Very frequently symmetrical pains occur in groups, followed by shorter or almost abortive pains with absence of the *stadium acmes,* and considerable lessening of the duration of the other stages as compared with the preceding pains. When several pains occur rapidly in groups of from two to four, with shortening of the pauses between them, followed by a longer final pause, Schatz calls them *combined pains,* and finds that the first of the group attains the highest elevation. The pains of the first stage of labor, according to the statement of every observant parturient woman, are much more severe than those of the second stage. This is due to the tension of the external os and lower uterine segment, and partly to the stretching of the uterine ligaments. In the second stage the pain is caused by the distention of the vagina and perinæum, as well as by direct pressure upon the nerve plexuses of the posterior pelvic wall and upon the rectum. Painless labors are very rare. The pressure during the height of a pain is said never to exceed 100 mm. of mercury = 1½ m. water pressure, and sinks to zero during the pause. Usually it is only about two-thirds, or even one-third of this height. The force of the pain remains about the same during the entire labor, or may perhaps increase to one-fourth more. Furthermore, the force does *not* increase with the resistance offered, but the pains simply become more frequent and last longer. The type of the pains is nearly constant in one and the same woman (*Schatz*). The force with which the child is expelled by the contractions is stated very differently by different authors. Haughton estimated it at 572¾ lbs., Stern at 470, and Poullet, who used the tocometer, at 50 lbs. at most. Duncan and Poppel compared it with the force necessary to rupture the membranes, and found that in easy cases it was hardly more than the weight of the child, and only in severe cases did it amount to 50 pounds. Duncan maintained that, if Haughton were right, the child would be shot out of the vagina at the rate of 36 feet per second. Schatz obtained a weight of 17 to 55 pounds by means of his *tocodynamometer*, and Ribemont found that 10,660 to 11,179 grams were necessary in order to rupture a fœtal membrane 10 cm. in size. Spiegelberg asserted, with justice, that these experiments were not reliable, because the pressure in the membranes is different from that upon the contents of the uterus. Leaman found, by means of a special instrument devised by him for the purpose of *measuring the force of labor*, that all cases in which the force did not exceed 2 to 2½ pounds, the forceps were necessary (*Parvin, l. c.*). All these methods have many defects; for instance, the last-named apparatus of Leaman does not allow for the resistance of the soft parts, that is to say the force with which the head advances is measured, but not that by means of which it is moved.

According to their purpose and effect, the following kinds of pains are distinguished in normal labor: In the first place the *dolores præsagientes* or *premonitory pains*, which are slightly painful contractions at the end of pregnancy, which may continue for days or weeks before labor actually occurs. The *dolores præparantes* or *preparatory pains*, are somewhat more frequent and more painful than the last-named, with a longer time at the height of the pain. These cause the bulging of the bag of waters and dilatation of the os. The *dolores ad-partum* are the *expulsive pains;* here the height of the pain predominates, is longer and stronger, and the pauses between the pains are shorter, the action of the abdominal muscles is felt, and the child is driven through the cervix into the vagina and then expelled from it. The passage through the external genitals is particularly painful, and also the period just preceding it, owing to the pressure upon the sacral plexus; so much so that the lower extremities shake and quiver, hence the last expulsive pains are called *dolores conquassantes* or *shivering pains.* The *dolores ad secundinas* finally expel the afterbirth, and are usually painless, but are felt more by multiparæ than by primiparæ. *Dolores post-partum* or *after-pains* are usual in multiparæ, and are more marked the more rapid the labor.

The *pulse*, *respiration* and *temperature* of the parturient woman are markedly influenced by the "pains." Hohl was the first to notice the increase in the frequency of the uterine bruit, and after him E. Martin and Maurer called attention to the *increase of the pulse.* If the pulse is counted for five seconds at the height of the pain, and for the same time during the pause, it will be found that it increases from one to several beats in five seconds during the height of the pain. As regards the *respiration,* according to my observations, the frequency is, without doubt, greater during labor than during the course of pregnancy (20.7 : 18.7). Furthermore, it is more frequent in the pause than during the pain, the difference being about 6.8 per minute. *During the pain,* it is considerably less at its culminating point, but increases as soon as the declining stage (*stad. decrementi*) commences. We often note, however, considerable increase in the same stage, rising from 20.5 during pregnancy to from 45.64 to 68 during the pains. The respirations usually keep pace with the temperature. In primiparæ the average seems to be somewhat higher (21.5), than in multiparæ (20.4). Beyond a doubt the rapid and usually shallow inspirations are destined to lessen the amount of heat produced by the contractions of the uterus, and are probably the result of retained heat. The long expirations furnish the principal outlet for the carbon dioxide. The lessened frequency during the height of the pains at the beginning of labor is due to the intense pain, later on to the action of the abdominal muscles, while the greater frequency in primiparæ is owing to the resistance offered by the soft parts. Analogous to the increase of the pulse, I often found (not always) *that the temperature rose* with the pain from about 0.36–0.93° F. This is only seen when the column of mercury has reached its highest point, for during the pause it sinks again to the former level to rise again with the next pain, and so on. *The examination and diagnosis of the pains* should be made by both external and internal manipulation. The hand is laid flat upon the abdomen, without pressure, while the fore and middle fingers of the other hand touch the external os, and a pain is then waited for. Having thoroughly established the presence of pains followed by pauses, it should next be determined whether they be normal or abnormal. The cervical canal and os are not simply drawn back over the presenting part, but, although their *rôle* as far as expulsion is concerned, is almost passive, yet their circular fibres surround the child and adapt themselves to it. The contractions are *recognized* as such by the pain they cause, by the perceptible hardening of the uterus, and their periodical recurrence, by the pauses free from pain, and the changes which occur in the cervix and the parts contained within it during the pains. It is not true that the pains, having once developed, may not be lessened or stopped by any means whatever. At least, distinct premature pains may be completely arrested, providing no detachment of the ovum have taken place. The force of the pains usually is not proportionate to the strength of the patient; for instance, we very often see very feeble women, almost dying of tuberculosis or other serious disease, who have an easy time and get through in a few hours. On the other hand, very powerful, full-blooded, muscular persons often develop weak faulty pains. For these reasons, it is impossible to prognosticate a certain degree of activity of the pains until we have observed a series of them, or know that they were of good character during a previous labor. The *vagina* is also concerned in the birth of the child, but is of subordinate importance. It expels the afterbirth gradually and slowly like any other foreign body, such as a tampon or colpeurynter, and sometimes it drives out the presenting foot, but is usually assisted in this by the uterus.

Next to the pains, the most important expulsive force is the action of the *muscles*, namely, all those which fix the thorax and pelvis and at the same time narrow the abdominal cavity. These are, at the lateral walls, the musculi obliqui externi, interni, and transversi abdominis; at the anterior wall, the recti and pyramidales; at the posterior wall, the quadrati lumborum, aided by the common erectors of the trunk; at the upper wall, the diaphragm, and below, the musculi levatores ani. The resultant of the forces of these muscles lies parallel to the axis of the superior strait. This influence is usually involuntary at first in primiparæ; they are forced by the pain, during the passage of the head through the cervix and the distention of the vagina at its upper part (perhaps where Dembo found the large ganglia), to bear down, whether they will or not. The same inclination is often so violent, during distention of the external genitals, that they cannot resist it, but in spite of all warnings bear down with the pains. The same tendency is not infrequently observed in transverse positions, or where the uterus or anterior lip of the cervix is pinned to the symphysis, and in these cases it may be exceedingly violent. On the other hand, this action may fail entirely, as in paralysis or narcosis, also in prolapsus uteri, and still the labor may be completed. Furthermore bearing down may occur in the case of profound syncope, or in those apparently dead, or nearly so. This muscular influence is effective partly because the uterus is raised up and fixed against the muscles by the round ligaments, and is thus compressed upon all sides, just as it is by the hand in expression of the afterbirth, and partly because the muscles press the uterus and its contents downward toward the posterior pelvic wall, so that the parts below supporting the uterus, and arresting its downward progress, its contents are thus pressed out. This force is so great that the child, having for the most part left the uterus, may be expelled with considerable force, as may sometimes be seen in births in the upright, and also in the recumbent position. It may even force the uterus out, too, or cause its inversion, when its lower parts have not contracted firmly. According to Bayer's investigations of the direction and distribution of the muscular forces of the uterus, there can be no doubt that the uterine ligaments, especially the round and utero-sacral, also participate in the contraction of the organ, and by compression help to empty it of its contents.

CHAPTER III.

The Obstacles to be Overcome during Labor.

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The obstacles which are opposed to the passage of the child are: (1) the bony pelvic canal; (2) the soft parts, *i.e.*, the cervical canal, the vagina and the external genitals; (3) the shape, size, attitude and presentation of the child.

1. *The Pelvis as a Parturient Canal.*—The pelvis as a whole is divided into the true (small) and the false pelvis (large). The false pelvis includes the lowest two lumbar vertebræ, the upper part of the sacrum, the inner surfaces of both the iliac bones, and the upper surface of the horizontal ramus of the pubis. Below it is bounded by the linea ilio-pectinea. The iliac bones in the woman are inclined at an angle of 60° to 65° to the horizon. The depth of the false pelvis is about 7½ cm. (from the middle of the connecting line between the cristæ, vertically down to the conjugate diameter of the superior strait). The true pelvis has an anterior, two lateral and a posterior wall, whose natural limits are the pubo-iliac synostoses and the sacro-iliac synchondroses. These synchondroses in the pregnant state are endowed with a certain degree of mobility, owing to their being saturated with fluids, so that the joints throughout labor may give way a little, though very slightly. The space thus gained at the superior strait is, however, very slight and without practical importance; but at the pelvic exit quite an important increase of space is possible, but is not entirely to be ascribed to the mobility of the joints (*Balandin*).

The anterior wall, formed by the pubic bones and the ascending rami of the ischium, is lowest at the symphysis (4 to 4½ cm. high). Upon its inner surface two inclined planes are easily recognized, the superior passing from above downward and backward to about the middle of the symphysis, and the inferior from above backward and downward, and is continuous with the external curved surfaces of the descending ramus of the pubis and the ascending ramus of the ischium. Below the symphysis is the pubic arch of 95° to 100°.

The lateral walls, formed by the bodies of the iliac and ischial bones, with the greater portion of the tuberosities of the latter, are usually about 9 to 10 cm. high, and also show two inclined planes; the upper, continuous with the upper plane of the os pubis, passing from above externally, downward and inward, ends at the spine of the ischium; while the lower, corresponding with the similar plane of the symphysis, runs obliquely from above, postero-externally, downward and inward. Balandin emphasizes the fact that the lateral walls of the true pelvis are not plane or concave, converging throughout their whole extent, but are divided at the middle by a constant elevation, separating them into an upper converging and a lower diverging section.

The posterior wall formed by the sacrum and the four bones comprising the coccyx, is 13 cm. high on an average, and two inclined planes are also recognized, whose boundaries correspond to the linea transversa secunda, or the body of the third sacral vertebra. The divergence of these two planes is usually greater than the before mentioned.

In the cavity of the true pelvis we first distinguish the superior strait or entrance to the pelvis. Balandin calls the entrance to the pelvis (with regard to the mechanism of labor) that space which exists between the plane of the anatomical conjugate and the upper pelvic strait. According to him, this latter is the circumference which is bounded by the internally projecting sacro-iliac synchondroses and the sharp border of the crista obturatoria interna. The superior strait is either oval (oblique or exactly oval), round, square, or wedge-shaped. The last two are said to exist only among Mongolians and Negroes.

The following diameters are to be noted at the superior strait: 1. The conjugata vera,* from the promontory to ½ cm. below the middle of the upper border of the symphysis = 11 cm.; 2. the oblique diameter, from the sacro-iliac synchondrosis to the ileo-pectineal eminence of the other side = 12.5 cm.; 3. the transverse diameter, or the greatest distance of the linea innominata from each other = 13.5 cm.

After the superior strait comes the wide portion of the true pelvis, bounded anteriorly by the middle of the symphysis; laterally, by the middle of the internal surfaces of the acetabula; posteriorly, by the middle of the third sacral vertebra; it has the following diameters:—

1. The conjugata, from the middle of the symphysis to the middle of the 3d sacral vertebra = 12½ cm.

2. The two oblique, from the middle of the upper border of the incisura ischiadica major of one side to the middle of the opposite sulcus obturatorius = 13.5 cm.

3. The transverse diameter, the line between the centre of one acetabulum and the centre of the other = 12 cm. Following this we have the narrower

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* This straight diameter was so designated by Roederer because he regards the superior strait as an ellipse, and therefore called its shortest diameter the conjugata. Anatomists draw this line from the middle of the promontory to the upper border of the symphysis; obstetricians locate its anterior end 0.5 cm. deeper.

portion of the small pelvis; this is bounded anteriorly by the lower border of the symphysis; laterally, by the spinæ ischii, and behind by the apex of the sacrum. 1. Its conjugate passes from the lower border of the symphysis to the apex of the sacrum = 11½ cm. 2. Its transverse diameter is the connecting line between the spinæ ischii = 10 cm. Here the oblique diameters are not considered, because the posterior ends correspond with the elastic lig. sacro-tuberosa. The transverse diameter of this region is the smallest of the whole pelvis. The spinæ ischii are exceedingly important points; they are easily felt, and the position of the external os, as well as that of the child's head, may be determined exactly from them; hence great importance is to be attached to them. They are also of importance in the mechanism of labor, of which more later on. The exit of the pelvis is bounded behind by the tip of the coccyx, laterally by the lower border of the lig. sacro-ischiadica and the tubera ischii and lower border of the symphysis. Here we measure, 1. The conjugata from the lower border of the symphysis to the tip of the coccyx = 10 to 12 cm.; 2. the transverse diameter, the connecting line between the centres of the tubera ischiadica = 11 cm.

The oblique diameters at this point, like those above, are of no importance. The characteristic shape of the female pelvis, its size and width, is brought about by the growth of the sexual apparatus within it, namely, the uterus and vagina, and, furthermore, the outward curve of the pubic rami is caused by the development of the erectile bodies, the bulbi vestibuli et vaginæ. In young girls the sacrum begins to widen and there is increased development of the pubic bones. The most important cause of the changes in the pelvis, however, is the weight of the body, whose influence is made manifest by the curvature of the sacrum, the deeper position of the promontory, the recession of its body between its two borders, the greater curvature and flattening of the iliac portions of the innominate bones, and the flattening of the symphysis. The pelvis, as Ziegenspeck aptly remarks, from the time of infancy to puberty, becomes more and more anteflexed. The changes caused by the soft parts, as regards the roominess of the pelvis, are only important at the inferior strait, as the psoas muscles are quite easily movable at the superior strait, and do not materially shorten the transverse diameter. The conjugate, on the contrary, is lessened somewhat by a series of soft parts, which are, posteriorly, the peritoneum and its underlying fascia; anteriorly, the walls of the bladder with its peritoneum; the urethra deeper down; and laterally, the obturator muscles. The conjugate is furthermore lessened by the double thickness of the uterine wall.

In the erect position, the two anterior superior spines and the middle of the upper edge of the symphysis lie in an almost vertical plane, which is intersected by the plane of the superior strait at a very acute angle. The angle which is formed with the horizon, in this position of the pelvis, by the prolongation of the conjugate of the pelvic inlet anteriorly, is called the angle of pelvic inclination, inclinatio pelvis. Its size is usually from 55° to 60°. According to the two Webers and Naegele, it is constant in the same woman; but H. Meyer believes it varies from 40° to 100°. The most marked inclination is found in cases of pronounced divergence of the axes of the extremities with extreme rotation of the same. In the normal position, the promontory is usually 9 to 10 cm. higher than the upper border of the symphysis, while the tip of the coccyx is only 2 cm. higher than the top of the pubic arch. Hence the inclination of the inferior strait to the horizon is much less, and only amounts to 10 or 11°.

German women, according to Schröter (Dorpat), have the greatest pelvic inclination, Poles less, and Jewesses still less. More than this, the pelvic inclination of the Jewish and Polish women is less than that of the men. Schröter confirmed the fact that the angle of inclination changes with the position.

The axis of the pelvis is a line which, curving forward through the true pelvis, intersects all the conjugates at their centres; it is also called the guiding line, since the hand follows it up in operations or examinations.

The female pelvis, apart from the difference in the bones, as compared with that of the male, has the following advantages: Its cavity is rounder, wider and shallower. This is because in the male the iliac bones and the sacrum are steeper, and the pelvis is narrowed like a funnel from above downward. The sacrum of the female is shorter, wider, more concave anteriorly, and directed farther backward than that of the male. The pubic bones form an arch of 90° to 100°, and not an angle of 70° to 75°, as in the male. The inferior strait is hence much wider in woman than in man. But, above all, the inclined planes, described above, are very marked in the female; slightly so, however, or entirely lacking in the male.

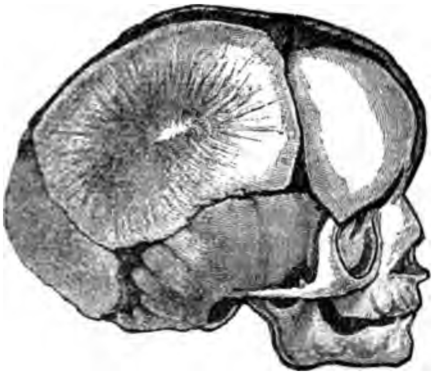
2. *The Resistance of the Soft Parts.*—The cervical canal is dilated by the bag of waters to six times its original calibre; as a rule, injury to this part is slight, but occurs so frequently during the passage of the head that the signs left upon the mucous membrane of the cervix and the lips of the os are the surest evidence of a previous labor. The resistance of the cervix is increased by premature rupture of the bag of waters (even when elasticity and size are normal), by an unfavorable position of the child in the pelvis (as in a pendulous abdomen), faulty position of the woman or unfavorable presentation of the child, so that the latter is exposed to unequal pressure. Moreover, the cervix, like the lower uterine segment, is essentially passive at first, and becomes gradually more dilated from within as the contractions continue. The resistance offered by the vagina has already been mentioned; it is very elastic, and the action of its muscular walls does little to advance the child. They rather close in upon the head from all sides and protect it from injury from without. The external genitals oppose an active as well as a passive resistance to the expulsion of the child; active, inasmuch as the

recoil of their muscles at the end of a pain causes recession of the head (this may easily be demonstrated by touching the inverted mucous membrane of the rectum, when a more rapid and stronger recoil occurs, and the head recedes), and passive because of the size and elasticity, as well as the position and length, of the perineum. Another influence is exerted by the remains of the hymen at the orifice of the vagina, where sometimes the resistance is greatest. Distention of the mucous membrane is also difficult under the ligamentum triangulare urethræ. For this reason accidents often occur here and at the posterior commissure.

3. *The Peculiarities of the Child's Head with Reference to its Passage through the Parturient Canal.*—We have already mentioned the diameters of the mature new-born child, and we must here describe the characteristics of the head which enable it to adapt itself to circumstances in passing through the hard and soft parts. It is, in the first place, provided with sutures and fontanelles. (See Fig. 30.) The sagittal, frontal and coronary sutures are usually several millimetres wide, often wider, while the edges of the lambdoidal suture usually touch, or the parietal bones may overlap the occipital bone. Hence a lessening of the transverse diameters of the head by about twice the width of these sutures is possible. Added to this there is often a certain flexibility of the bones, which may amount to a lessening of from 0.5 to 1 cm. in the transverse diameters. The large fontanelle is usually 2 cm. long and nearly the same in width in the mature child; the smaller fontanelle, on the other hand, is not felt as a membranous depression, but as an acute angle. The large fontanelle permits of a displacement of the frontal bone under the temporal bones and is also capable of resisting a pretty firm impression.

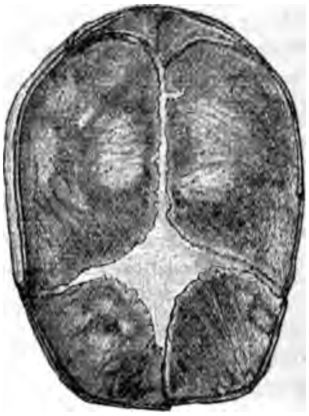
Almost as important as these are the two antero-lateral fontanelles (see Figs. 13, 14, 15 and 30), between the large wings of the sphenoid, the lower part of the frontal and anterior part of the temporal bones, because the bones at this point may be pressed in and moved in all directions, without injury to them, but with considerable lessening of the transverse diameter of the head; hence these fontanelles are of the greatest importance in contracted pelves at the time of the entrance of the head into the true pelvis. Finally, the so-called defects of ossification (Fig. 31) are quite essential to flexibility of the head, and explain why, in spite of a large head and small pelvis, a subsequent labor may sometimes be easier than a previous one with a smaller child. They are found most frequently in both of the parietal bones, seldom in the frontal, but oftener in the occipital bone. They are irregular in shape or round, but seldom diamond-shaped; they may be as large as the entire bone. Fissures often connect them. They allow of considerable flattening of the bone affected, and impart to the cranium that peculiar parchment-like consistency which may be appreciated during and after labor by compression of the head. Stadfeldt has proven that a physiological asymmetry of the fœtal skull may obtain entirely independent of labor, and that this usually consists of a marked flattening of the right side of the cranium, while the left side, especially at the occiput, is more rounded. This begins early; Stadfeldt found it about the sixth month. It is also noticed in breech cases, and in children whose mothers have died before delivery. The form of the skull varies considerably: round, oval, elliptical, brachycephalic, and dolichocephalic heads are found. In general (*Clarke, Hecker, Simpson and Stadfeldt*), the male skull is somewhat larger than the female in all diameters as well as in the horizontal circumference.

FIG. 30.



Small skull of a brow presentation, with sutures and fontanelles.

FIG. 31.



Defects of ossification in both parietal bones.

During labor, the bones of the advancing anterior part of the head are pushed back and over those behind them, more rarely the posterior bones overlap the anterior. Sometimes the sutures overlap at the middle of the vertex. This occurs in an ordinary labor, and in a normal pelvis is caused by the soft parts, very rarely by the pelvis. It amounts to only about 3 to 4 mm. in the transverse diameter, and usually disappears immediately after delivery. When one diameter of the head is shortened by this means, the opposite diameter becomes somewhat longer; as, for instance, in shortening of the transverse, the straight diameter, or in that of the vertical, the transverse and straight diameters are longer.

CHAPTER IV.

The Phenomena of Labor. The Stages of Labor.

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Normal labor is divided into *three stages*. The first of these is designed to prepare and open the passages for the child, and is therefore called the *stage of dilatation*; the second continues from the end of the first stage until delivery of the child, and is called the stage of expulsion; while the third stage comprises the expulsion of the afterbirth. The beginning of labor is recognized by the open external os in multiparæ, and by its beginning to gape in primiparæ; by the detachment of the ovum from the wall of the uterus and its protrusion into the cervix, associated with painful contractions. The so-called ring of contraction is indicated at the end of pregnancy by the marked thinning of the wall of the uterus below the point of attachment of the peritoneum; the lower uterine segment is usually longer in front than behind. During the first stage the ring of contraction travels higher and higher as the pains succeed each other, the internal os is thereby opened, and this is followed by the dilatation of the external orifice. The cavity of the uterus becomes smaller, and a portion of the ovum invades the lower uterine segment and cervix; by the end of the first stage the ring of contraction is above the superior strait in all cases (*K. Schröder*). Bayer and Hofmeier hold that the lower uterine segment remains passive during birth. The pain causes increased congestion of the genitals, as is shown partly by the relaxation and widening of the parturient canal and partly by the increased secretion, lubricating the internal surface of the genital canal. As the membranes pass the external os, the traction and the pressure upon the neighboring lower border of the placenta causes slight bleeding during the pains; this is not caused by laceration of the os. The pains recur at intervals of five, three or two minutes, and make themselves felt especially in the back and toward the thighs. Many patients walk about during this period, or hold on to a table or chair, usually stooping down over it. The pain in the back is also felt often during the intervals. As the pain passes off, the membranes relax, the child's parts are more distinctly felt and again become movable. When the cervix has gradually dilated to about five centimetres in width, the bag of waters remains tense, is now ready to burst, and usually projects deep into the vagina, sometimes it is seen at the vulva even when the membranes are only normally resistant. As soon as the cervix is completely dilated, *i.e.*, has attained a diameter which will permit the passage of the sub-occipito bregmatic diameter of the head, or about eight to nine centimetres the head begins to enter it. Usually the bag of waters now ruptures, at the beginning of a pain, and this is sometimes distinctly heard; the liquor amnii between the membranes and the head flows off, but its complete discharge is prevented by the simultaneous adaptation of the cervix to the head. The shape of the bag of waters is round and flattened; it may sometimes rupture above the external os, in which case less fluid is lost at the time of rupture, but more during the intervals between the pains. The bag of waters is larger in oblique, face and breech presentations, and the outflow of amniotic fluid, therefore, is greater. Sometimes fluid finds its way in between the amnion and the chorion, flowing off after rupture of the latter. The membranes allow fluids to transude through them to a certain extent, so that the lubrication of the parts is thereby increased. Now the parturient woman passes into the *stage of expulsion*, the soft parts embrace the head and cause overlapping of the bones at the sutures, thus wrinkling the scalp and preventing the return of its blood. Now, since the parts without the uterus are exposed to less pressure than those still within it, where compression is symmetrical, the caput succedaneum begins to appear on the part of the head over or in the cervix. In normal cases only the soft parts, namely, the external os and cervical canal, also the vulva in primiparæ, contribute to this formation, but not the pelvis. If the amniotic fluid is retained until immediately before the birth of the head, this tumefaction does not develop, except under peculiar conditions. Furthermore, in appropriate cases the ovum may be expelled complete; if the membranes are torn, but still cover the child's head, it is said to be born with a caul, and this is thought to be a lucky omen by some. Rotation of the head, which will be referred to later, with the discussion of the different positions, does not usually occur until the head has entered the cervix, but often takes place still later.

At this time the woman experiences an uncontrollable desire to bear down, whereby the experienced practitioner recognizes without examination the transition of the first stage into the second, or the expulsive period. According to Schroeder, during the expulsive stage, the fundus uteri does not follow the child's body, but remains higher up, and the child is hence advanced slowly by the general pressure upon the remaining contents of the uterus; and when the head reaches the floor of the pelvis, the uterus, owing to its recession, has very little further influence upon the advancement of the child, which is accomplished by the action of the muscles (abdominal, diaphragm, etc.). In cases of delivery after the death of the mother, due to the gases resulting from putrefaction, or in those affected with paralysis of the whole lower portion of the body, Schroeder must concede, however, that the contractions of the uterus alone may suffice to expel the child, although the work is undoubtedly shared by the diaphragm and the lessening of the size of the abdominal cavity during respiration. At any rate, the action of the muscles above mentioned is said to be the chief force during the expulsive stage, and the nearer the edge of labor approaches the greater the ascendancy of this force. The floor of the pelvis is pushed back by it, while the vagina is distended by the head, for at this time only the lower extremities remain within the cavity of the uterus. After the birth of the head the uterus is said to have no more influence upon the expulsion of the body; this is accomplished by the law of gravity in the standing position, while the contraction and elasticity of the vagina effect it when recumbent (*K. Schroeder*). I must confess I do not quite agree with this hypothesis. I beg to call attention, in the first place, to Braune's plates of two women who died during the second stage, in which the child's head is seen to be entirely without the uterus, and yet the fundus is in as direct contact with the breech and extremities as is usually the case while the breech is in the higher position. Moreover, I do not understand why the fundus should not descend with the evacuation of its contents, in view of the contraction of the round ligaments and the common pressure exerted upon it by the abdominal muscles, etc.; furthermore, the fundus would have to be a great deal higher immediately after birth than it really is, *i. e.*, not at the umbilicus, but at least three fingers' breadth above. This would certainly be the condition it this view were correct; this is not the case, however. We shall return to this subject hereafter. The patient is suffering less pain than during the first stage, and she observes with joy that the labor is progressing favorably under the influence of the great bearing-down pressure upon the uterus. As soon as the head reaches the floor of the pelvis, the furrow formed between the nates by the perineum begins to get shallower and the anus gapes during the pains, disclosing the anterior wall of the rectum, which seems to be the continuation of the perineum. The patient now feels an ardent desire to go to stool, and many insist upon getting up to do so, when there is little to evacuate.

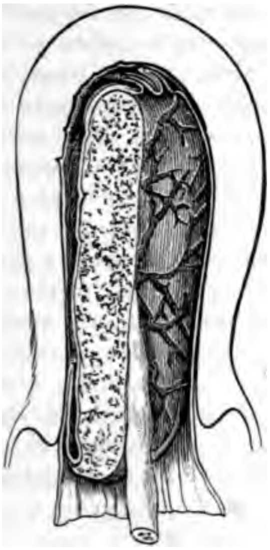
The presenting part, however, with the disappearance of the pain recedes again, a quantity of liquor amnii passes off, the anus closes, and a moment of rest ensues, during which time the fatigued patient, much flushed, heated and perspiring, not infrequently drops off to sleep. This remarkable tendency to sleep, sometimes noticeable at the very beginning of the interval, is probably due to the great muscular work and consumption of oxygen, and is not to be referred to congestion of the brain. Another pain brings the head back to its place again, the labia minora are forced apart, a fold of the scalp appears, and five, six, or more pains follow before the head recedes again, and this goes on until the elasticity and contractile power of the muscular and tendinous structures of the floor of the pelvis are overcome. The next pain distends the vulva still more, the fold between the labia majora and minora disappears, the sharp border of the latter embraces the fold of the scalp, which becomes bluer and bluer, small quantities of blood pass off, the pains become more violent, the patient's thighs quiver, pain in the calves being felt by some, the inclination to bear down is greater, and finally, with one more pain and a loud cry, the forehead and face of the child sweep out over the perineum, a quantity of liquor amnii escapes, and the head is born. Usually a short pause now occurs and then a new pain, accompanied by some hemorrhage perhaps, comes on, the child turns upon its long axis and passes out, aided by more or less bearing down upon the part of the patient, and followed by blood and more amniotic fluid. The *second* stage is now at an end, and the happy mother recognizes that the child lives by its lusty cries. During its progress through the maternal organs the child is subjected to certain changes, of which the development of the caput succedaneum has already been discussed.

An important point as regards the child's condition is the change which occurs in the activity of the child's heart during the process of delivery. The difference in the frequency of the heart sounds in boys and girls has already been alluded to, and it was mentioned that Steinbach, Danzats and Ziegenspeck agreed with Frankenhäuser in finding the female heart sounds to be more frequent than those of the male; according to Frankenhäuser, 136 in boys and 139 in girls. During labor the frequency is first influenced by the isolated pains, increasing with the beginning of each pain and slowing down again somewhat at the culmination, to rise again with its descent. Ziegenspeck found the frequency to be 139.46 in the first stage, and 137.27 during the second, or somewhat less in the latter case. The slowing during the pain may amount to 10 or 12 beats in 10 seconds (*Kehrer* and *Ziegenspeck*). At the time of the pause, after the previous decrease in frequency, the normal rate recurs. The explanation of this fact is not easily found. The theory of venous congestion due to compression of the placenta during the pains, and extending to the fœtal heart (*Schwartz*), was denied by Bezold, Stezinsky and M. and E. Cyon, because compression of the aorta fails to cause slowing of the pulse, although Knoll is of the opposite opinion. Later on, B. S. Schultze maintained that it was the want of oxygen in the fœtal blood, and consequent irritation of the vagus, caused by the pains, which retarded the heart's action. According to Soltmann's experiments, however, the inhibitory centres of the brain and vagus are very incompletely developed in the newborn child, and Kehrer justly called attention to the fact that there could be no compression of the capillaries of the villi, in view of the symmetrical intra-uterine pressure, and that irritation of the vagus would lead to an attempt at respiration with the simultaneous retardation of the pulse, which, however, is not the case. It is decidedly more probable that the diminished frequency is due to the increased general pressure upon the contents of the uterus, since according to Marey the frequency of the heart is in inverse proportion to the peripheral resistance; in the fœtus increase of arterial pressure must ensue, because there is arterial congestion, and hence we have diminished frequency of pulse. Finally, the compression of the head, and the irritation of the vagus thereby induced, was suggested as an explanation of the lessened heart's action, and it is a fact that this is more marked at the end of the first and second stages. Ziegenspeck accepts this explanation for the slowing noticed in the second stage. None of these theories, however, are completely satisfactory, for, as Schwartz and Ruge have recently proved, the pains sometimes have no influence whatever upon the heart, which fact Ruge advances as a proof of the correctness of his theory of the connection of the placenta with the uterine wall; he maintains that although the nourishment of the child is interfered with by labor, its supply of gases is not influenced by the changes affecting the maternal tissues, even though there be obstruction to the blood current, because the intervillous circulation, heretofore thought necessary to the child's nutrition, does not exist.

The hemorrhage which occurs with the passage of the child's body is partly caused by lacerations in the mucous membrane of the vulva and partly by the detachment of the placenta, whose separation from the uterine wall, as a rule, undoubtedly takes place in part, or even is wholly completed during the last expulsive pains of the second stage. For a long time past, and also recently, it has been a mooted question as to how this separation takes place. According to my experience, B. S. Schultze has given the most natural explanation. According to his view, a retro-placental hæmatoma is formed by the approximation of the thin, firmly adherent borders of the placenta, this approximation being due to the marked decrease in the size of the uterus in length, breadth and thickness. The median portion is thereby pressed toward the centre of the uterus, whereupon a large quantity of blood is poured out from the open sinuses behind the placenta, and gradually forces its surface more and more away from the uterine wall. Hence, in its detachment from the uterine wall the placenta, as it were, rotates around the transverse diameter of the uterus and sinks into the membranes.

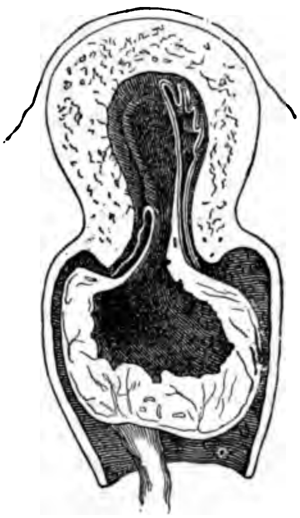
On the other hand, Matthews Duncan, supported by Spiegelberg, believes that the placenta is not cast out with the fœtal surface as the presenting part, but, on the contrary, that its lower border is the first to appear, and that it only folds or rolls over toward the fœtal or maternal surface. Its exit with the smooth fœtal surface forward and inversion of the membranes they claim to be due to premature traction upon the cord or very forcible expression (?). The fallacy of this view is proved by our investigations, in 1885, at the Munich Clinic, published in Trenkler's inaugural thesis, where it was seen that *expulsion of the placenta*, left entirely to nature, without the slightest interference with the cord or fundus, took place, in three-fourths of all the cases, in precisely the same manner as described by B. S. Schultze (see below). Schroeder has also confirmed Schultze's views in this respect, but disagreed with him as regards the participation of the contractions of the uterus. He maintained that, although the uterus becomes much smaller during the expulsion of the child, the placenta is not detached by the strongest pains, because the greater the pains the greater the force with which the placenta is pressed against its insertion, and that it is only after complete expulsion of the child that the intra-uterine pressure sinks and permits of the formation of the hæmatoma and detachment of the placenta. Having left the contracting portion of the uterus, it lies in the lower segment, then in the cervix, and eventually in the vagina, whence it is driven out in only a very few cases by the contraction of the abdominal

FIG. 32.



Placenta emerging with edge presenting. (*Duncan.*)

FIG. 33.



Placenta emerging with fœtal surface presenting. (*Schultz.*)

or vaginal muscles or their elasticity. In Schroeder's 500 cases this took place spontaneously in ten minutes in 8 cases only. However, he himself acknowledged that this hypothesis was not based upon positive observations, but was rather the result obtained in a number of doubtful cases and from theoretical reasoning.

Ribemont-Dessaignes believes that detachment is simultaneous at all points of the placental surface.

When the placenta is situated, as is usually the case, with its lower border just above the internal os and its centre juts out into the uterus, it must project into the membranes and pass through the vulva with its fœtal surface looking forward, while during this time the blood from the uterus would be poured out into the membranes, which at the same time would be detached by the weight of the placenta, which has become trough-shaped. This mode of separation is the usual one, according to our observations (see *Trenkler*)—76 times in 100 cases. The placenta rotates in all probability upon its transverse diameter, but it is not improbable that this revolution may be around the vertical axis, according as the one or the other part of the centre is more slowly detached. Should the part next the internal os become detached first, the blood from behind it could not collect there, and the loose part would be the first to enter the cervix, and, being seized by the contraction of the soft parts, would drag the more highly situated portion after it. In this case the lower border and uterine surface would be the first to appear, followed finally by the membranes, which consequently are sometimes torn away at the edge of the placenta. This happened only ten times in 200 of our cases. Finally, there is another method in which the placenta at first seems to be half inverted, and then rotates upon its long axis, thus causing the uterine surface to present uncovered. This was noticed 14 times in 100 cases. The following table shows the different varieties of expulsion and their frequency:—

	PRESENTING PART.		
	Fœtal Surface	Uterine Surface.	The Edge.
Pinard	61	2	7
Ribemont-Dessaignes	12	1	4
Trenkler (Munich Clinic)	76	10	14
	149 = 79.9%	13 = 7.5%	25 = 12.6%

The entire quantity of blood lost during natural detachment of the placenta is from 60 to 530 grams, with an average of 225 (75 fluid, 150 coagulated). Ahlfeld found 257 gm., Fehling 169 or 235. The pains which expel the placenta, usually make their appearance about ten or fifteen minutes after the complete expulsion of the child, and having descended, it is expelled in from one-quarter hour to fourteen hours, chiefly by the aid of the contraction of the abdominal muscles. This may be very much accelerated by kneading the abdomen. Parvin states that the placenta is usually born within twenty minutes after the birth of the child, while Zweifel gives five to thirty minutes as the ordinary period. I could confirm this in only about one-fifth of my cases; usually the third stage is longer and the average duration should not be placed at such a low figure, in order to avoid too early and unnecessary interference.

In animals the above mechanics has also been observed. Danilowitsch found that in the rabbit, under normal circumstances, the detachment and expulsion of the placenta is coincident with the pain which completes the birth of the young. It becomes cup-shaped, and is expelled in the course of twenty minutes, followed by a slight hemorrhage.

After labor is over, the parturient woman, who is usually perspiring freely in consequence of the excessive muscular exertion, feels greatly relieved, and there only remains a burning feeling of the vulva, caused by the tearing of the mucous membrane at that point, and the discharge of fluids gradually lessens in quantity and finally ceases. Some puerperal women during the cleaning up process are chilly, and have a tendency to shivering. The first joy at the happy ending of the birth having passed off, they experience a sense of the need of recuperation, and this manifests itself by a desire for food and drink, but more frequently by a longing for sleep and rest. As long as the placenta remains in the uterus, the fundus retains its position above the umbilicus, but as soon as the afterbirth enters the vagina, it sinks to the navel, and having left the uterus entirely, the latter is felt below the umbilicus, is quite hard, and about the size of a man's fist. The uterus may still retain a small quantity of liquor amnii after the complete delivery of the child, which may be demonstrated by direct pressure upon the uterus, whereupon the fluid escapes.

The duration of the several stages of labor varies extraordinarily; primiparæ and multiparæ differ markedly in both of the first two periods, especially so in the second, which is often ended by one pain in those who have borne one or more children. The first stage may last in both classes of patients from a few hours to several days; 12 to 20 hours is the average in primiparæ, 6 to 12 hours in multiparæ. The second stage may last from 1½ to 7½ hours in primiparæ, and from ¼ hour to 1½ hours in multiparæ; finally, the third stage, if it terminates spontaneously, lasts about 2 to 2½ hours.

In order to clearly understand the effect of uterine contractions upon the child, it is well to divide it into two forces, namely, the real contraction, whereby the uterus symmetrically compresses the whole of its contents, which is called the intra-uterine pressure by Schatz. As the uterus chiefly contracts transversely, the child is elongated, its lower and upper ends are pressed upon more firmly by the uterus, which is thus prevented from shortening its long axis. This pressure Schatz called the uterine force of form restitution. If it is very strong at the lower pole, it may be compensated for by greater tension of the lower uterine segment, and in this case the pressure upon the liquor amnii at this point is much less than in the remaining parts of the cavity of the uterus, and a caput succedaneum may form even with unruptured membranes. If, however, the membranes are very tough, and this latter force excessive, the water in front of the presenting part is subjected to the same amount of pressure there as elsewhere, and the head cannot pass forward because the water cannot escape. If the bag of waters has ruptured, the intra-uterine pressure pushes the head through the external os, and the elongation of the child and the force of form restitution drive the head out of the uterus.

The temperature during normal labor does not differ from the normal, *i. e.*, there are two daily elevations and depressions. This corresponds, as I was the first to prove, in general to the usual diurnal variations, the highest morning rise being between 8 and 10 o'clock (99.68), and the second highest point from 4 to 8 o'clock in the evening (99.71), while the lowest degree is in the morning from 2 to 4 (99.14) and at noon from 12 to 2 o'clock (99.32). As a rule, the temperature does not rise at all during labor, or else very slightly, and variations do not amount to more than 0.9° F., or even 0.27°, on an average—in short, about the same as the normal. Its highest point varies from 97.88 to 100.4, with an average of 99.32, or only about 0.36 to 0.54° F. higher than in the healthy individual, and about 0.18 to 0.36° higher than the healthy gravid woman. It appears to be somewhat higher during the second stage than in the first stage (99.41 : 99.86). There is no difference in primiparæ and multiparæ as regards either the highest point or the daily variations. The temperature is a very important sign as far as the condition of the parturient woman is concerned, and we may often recognize, with the aid of the thermometer, a disease which may continue during the puerperal state.

The temperature directly after delivery, as compared with that taken during labor, corresponds to the time of day, but on the whole is slightly higher than during labor. It is much more constant, in health, than the pulse and respiration. It may be readily taken in a very few minutes in the vagina or rectum without annoyance to the patient. The elevation during labor being so slight, although the strain is very great, a large amount of heat must be lost externally. This is brought about partly by increased evaporation from the skin and partly by the increased respiration (long expirations). Furthermore, cold drinks and very little nourishment are taken during labor, so that very little heat is gained in this way, and, finally, the parturient woman is lightly clad and frequently uncovered; so that all these factors tend to compensate for the natural tendency to elevation of temperature during the pains. As far as the kidneys are concerned, the quantity of urine is increased, its specific gravity is less, as well as the excretion of PO_5 and SO_3, while on the other hand NaCl is considerably increased. The second stage is distinguished from the first by an increased secretion of urine, with an increase also of N, PO_5 and SO_3, but NaCl is especially increased. Finally, the yield of N, NaCl, PO_5 and SO_3 differs during labor according to the time of day, and corresponds, on the whole, to the temperature curve. The cause of these changes is the increase of pressure in the aorta, and, on the other hand, the nervous excitement, also the lack of food during labor, while the muscular activity is comparatively great. Albuminuria, even in normal labor is not infrequent. Halbertsma believes that this is not caused by reflex contraction of the renal arteries in pregnancy, but more especially by the lack of proportion between the hypertrophic uterus and the size of the abdominal cavity, and most frequently by compression and tension of the ureters. Finally, during the whole of labor the parturient woman loses weight. According to P. Baumm's observations in my clinic, this amounts to 6242 gm. per 61,406 kgm. of the patient, taking an average of 60 cases. This loss is made up as follows:—

1. Child,	3265	grams.
2. Placenta,	628	"
3. Liquor amnii,	1300	"
4. Blood,	308	"
5. Excrementa,	366	"
6. Evaporation from lungs and skin,	375	"

Young and old parturient women are similar in this respect; primiparæ lose somewhat less (= 150 to 300 gm.) than do multiparæ. For every kilogram of weight of the woman in labor 101.65 gr. are lost, according to Baumm, and 104.5 gm., according to Gassner.

CHAPTER V.

The Mechanism of Labor. Frequency of the Different Presentations. Course of Labor in Vertex Presentations.

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In the presence of regularly developed resistance, the influence of the forces described above, causes the expulsion of the child in a definite and fixed manner; this is called the mechanism of labor. The mechanism differs according to the presentation. The frequency of the different presentations is reported differently by different authorities; my observations are as follows:—

Among 3078 presentations in Dresden, I found:—

95.4 per cent.,	Vertex, I : II = 64.1 : 35.9 per cent. (deviating mechanism, 20).
0.6 per cent.	Face. Forehead.
3.6 "	Breech.
0.42 "	Transverse.

Among 1732 presentations in Munich, we found:—

93.0 per cent.	Vertex, I : II = 64.7 : 35.3 per cent. (deviating mechanism, 26).
0.8 per cent.	Face. Brow.
4.6 "	Breech.
1.5 "	Transverse.

Spiegelberg found the proportion of the first and second vertex presentations = 65 – 65.8 : 34.9 – 34.1, and with occipito-posterior third 0.57 – 0.68 : fourth 0.22 – 0.33 per cent. K. Schroeder calculated, according to clinical observations of from one-quarter to one-third of a million cases:—

95.0 per cent.	Vertex.	These figures correspond almost exactly with my Dresden observations. (See above.)
0.6 "	Face.	
3.11 "	Breech.	
0.56 "	Transverse.	

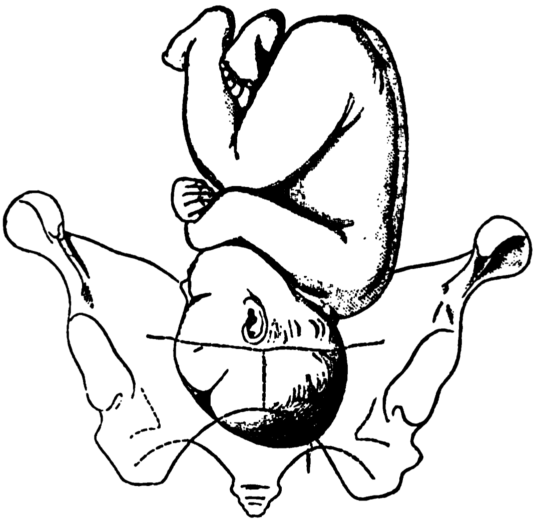
In primiparæ the head usually engages at the beginning of labor. The lower uterine segment, *i. e.*, the portion lying between the ring of contraction, the thickened uterine muscle, and the lower end of the supra-vaginal portion of the cervix, becomes thinner even during pregnancy, and then distinct contractions make their appearance. This ring is drawn up higher by strong contractions, and may be as high as a point midway between the symphysis and navel. The internal os is thus stretched and opened, and the ovum enters it. The external os, however, in contrast with multiparæ, is still closed; while in the latter it opens as soon as the cervix has been obliterated, and hence the lower uterine segment and cervix are not so much stretched as in primiparæ.

Mechanism of vertex presentation. The first vertex presentation, according to the above tables, is almost twice as frequent as the second. The reason of this is probably the relation the uterus bears to the superior strait, its anterior surface being directed more to the right and to the front. Its right side is a little posterior and nearer to the sacro-iliac synchondrosis, while the left side is freer and projects forward. Hence, the child evidently has more room in the left side of the uterus, or at least its position is not interfered with by the spinal column. We recognize the vertex presentation by external examination, by the long shape of the uterus, the presence of the breech and small parts at the fundus, and by the location of the fœtal heart sounds to one side of the uterus below the navel. We also recognize the possibility of a vertex presentation by feeling a large round hard body which fills up the upper part of the vagina in all directions. It has already been mentioned that the sutures may sometimes be felt through the thin lower uterine segment, often before the opening of the external os. The only sure means of recognizing the head is the discovery of the sutures, fontanelles and hairs of the head, which may be easily felt, after rupture of the membranes, or seen with the speculum.

FIRST VERTEX POSITION (FIG. 34).

The small parts of the child are to the right in the fundus, with the breech to the left of them, while the back of the child lies to the left side of the uterus. The heart sounds are heard at about the middle of a line drawn from the navel to the left anterior superior spine; the head is felt from the outside, with its vertex in the superior strait. Internally, at the beginning of labor, the child's head is felt in the transverse diameter of the pelvis, the small fontanelle to the left, and the large fontanelle somewhat higher and to the right. The mechanism by means of which the head passes through the pelvis is as follows:—

FIG. 34.



First Vertex Position.

(1) The head turns upon its transverse diameter, and the chin nears the chest, owing to the entrance of the head into the cervical canal, as well as to the contractions of the uterus. In this way the small circumference of the head, 32 cm., is the greatest which is to pass through the circumferences of the pelvis. This rotation is due to the uterine force of form restitution, because the anterior lever arm of the head is the longer. The head then passes slowly down, and (2) begins to turn upon its long oblique diameter, so that the small fontanelle comes around more to the front. This does not begin until the floor of the pelvis is reached, and is due to the same force, which causes the head to advance in a line which continually curves forward, the so-called guiding line. The expulsive forces, the uterine con-

tractions and the abdominal muscles act in a line extending from above anteriorly downward and backward, while that of the floor of the pelvis expends itself in an upward and forward direction, and the result is that the head passes forward. The occiput glides forward above the spina ischii, because the latter opposes an obstacle to advancement in the backward direction; it also passes forward because there is more space there than between the spine and the side of the sacrum; furthermore on account of the lesser resistance at that point; and, lastly, because the inclined plane readily allows it to turn anteriorly. In vertex presentations the head usually (81.4 per cent. according to Spiegelberg) enters the transverse diameter of the pelvis, rarely (18.5 per cent.) an oblique diameter. When the latter is the case, the occiput is more frequently behind and to the right than in front and left. The long axis of the child's body does not fully follow the rotation of the occiput, but remains about 30° or more behind it; the uterus and breech also turn a little with the head. As soon as the rotation around the vertical axis is almost completed, so that the small fontanelle is quite near to the crest of the pubic arch—

(3) A rotation upon the transverse axis of the head begins in a direction opposed to that of the first-mentioned rotation. It is the result of the pressure of the pelvic floor. The occiput passes up under the pubic arch, while the anterior part of the head passes down in front of and near to the sacrum and coccyx; in short, the chin moves away from the chest. The posterior part of the right parietal bone is the first to appear, and if carefully examined it is found that the head very seldom enters the outlet of the pelvis exactly in its straight diameter, but usually somewhat obliquely, so that the large fontanelle makes its appearance a little to one side, over the posterior commissure. The head is about to pass through, when the large fontanelle may be felt right over the posterior commissure. The transverse diameter does not pass through the external genitals transversely, and so the small diagonal is the largest diameter to pass through the external opening.

(4) By the time the head is born, the shoulders have already entered the true pelvis in an opposite diameter to the one the head entered, *i.e.*, in the second oblique diameter, and the anterior right shoulder rotates gradually around from the right until it gets under the pubic arch, while the left sweeps up over the perineum from the left side. Rotation of the child's body, therefore, takes place around its long axis here, and when it passes through the vulva—

(5) Another rotation of the trunk around its sagittal axis occurs, the posterior shoulder being slightly raised. The child's face, as a result, turns toward the inner under surface of the right thigh of its mother.

In general, in normal mechanism, the face of the child turns toward the side of the mother which corresponds with its original direction in the pelvis. If the head of a child born in the first position is observed, the caput succedaneum is noticed upon the upper and posterior part of the right parietal bone and the right half of the occiput. Besides, the cranial bones are usually displaced, so that the right parietal bone overlaps the left, the left frontal bone overlaps the right, and both of these are overlapped by the parietal bones, while the occipital bone appears pushed under the last named.

Since the pelvic inlet forms a moderately acute angle with the horizon and the long axis of the uterus is almost perpendicular to the plane of the inlet, it follows that all those parts of the child corresponding to its anterior side must lie deeper than those which are turned posteriorly.

The vertebral column of the fœtus becomes convex on the anterior wall of the uterus by reason of the abdominal contractions, which force back the fundus of the uterus lying anterior to the round ligaments much more strongly than they do the lower portions of this organ. The head thus becomes inclined toward the posterior shoulder, and the base of the skull is forced somewhat to the front, and the transverse diameter of the head shows an inclination toward the plane of the inlet, so that the sagittal suture is directed more posteriorly (Naegele's obliquity). By Solayres' obliquity is understood the entrance of the head into the pelvic inlet in an oblique diameter; by Roederer's, the extreme flexed position of the head on the body. Usually Naegele's obliquity does not occur; that is to say, the axis of the uterus coincides with the plane of the pelvic inlet and both parietal bones, under normal conditions, stand equally high in relation to it. On the contrary, the vault of the skull does not enter the horizontal plane with both of these bones at the same level, but the anterior one must be the one which lies deeper, and hence on this is formed the caput succedaneum, as it is always found on the fœtal part which is in front and the first to pass through the external os.

This is so constant that, without having been present at the delivery, we can still diagnosticate from the situation of this tumor on the child in what position the fœtus was born. Sometimes, and yet only in exceptional cases, it happens that the tumor is spread out over both parietal bones; this occurs, for instance, if the head remains half delivered for a long time in the external genitals. Post-mortem, the proper situation of the caput can be distinguished from this unimportant constriction by the degree of the exudation. Medico-legally it is of importance to mention that, in the neighborhood of the infiltration which corresponds to the position that the child has had, extravasations of blood, varying in size from a darning needle to a pea, are found on the pericranium under the aponeurosis in those cases in which the delivery has not been especially difficult. In the delivery of a first vertex position we find, besides, the cranial bones so forced under each other that the right parietal projects more posteriorly than does the left and its tuber parietale does not stand opposite the other one, but according to Dohrn's measurements, on an average is moved 5.3 mm. more toward the occiput. This is produced by the pressure which the posterior side of the skull experiences on the sacrum, and occurs only when the occiput lies very deep. This side is thereby also flattened and the anterior is more rounded. The asymmetry thus arising is the result of the delivery and not to be confounded with that which has been propounded by Stadfeldt. It has been repeatedly found by K. Schroeder on the skulls of children from 8–14 days old.

SECOND VERTEX POSITION.

Diagnosis.—By palpation the breech is found in the fundus uteri on the right, the feet on the left; the heart sounds are heard on the right of the median line about the width of the hand below the navel. On internal examination the small fontanelle is found on the right and often at the commencement somewhat posterior; the large one stands higher up on the left and often anterior, therefore the small diagonal diameter of the head corresponds to the first oblique diameter. The left parietal bone is turned to the front and presents deeper than the other. The five movements of rotation described with the first cranial position occur also in this one, in such a manner, however, that the occiput in the second position pursues a longer course from the right side posteriorly to the right anteriorly, then the small diagonal diameter stands in the left oblique, and finally the occiput passes under the symphysis from the right.

The caput is formed on the posterior upper third of the left parietal bone. After the birth of the head the shoulders pass from the right oblique diameter into the antero-posterior diameter of the outlet, the left coming under the pubes and the right over the perineum, therefore the face is turned to the upper and inner part of the mother's left thigh, and the belly appears on the left and the back on the right. The rotation forward in a second vertex position can proceed just as rapidly as in a first vertex, and as a rule scarcely lasts any longer than in the latter.

CHAPTER VI.

Abnormal Mechanism in Vertex Presentations.

LITERATURE.

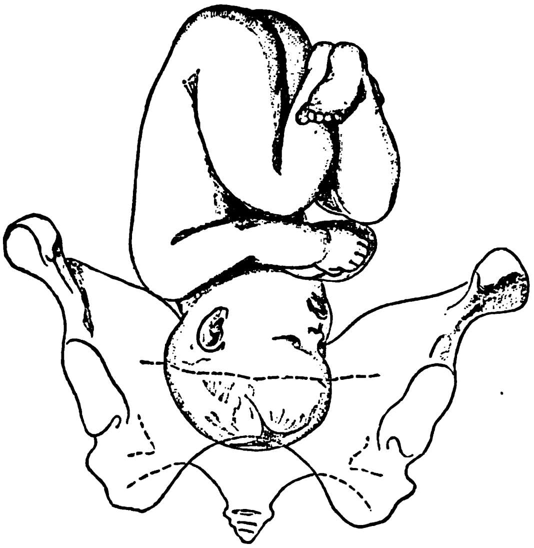
Landis: *Amer. Journ. of Med. Sciences*, 1877, Jan., No. 145, 71. Loviot: *Annales de gynécol.*, 1884. Richardson: *Boston Med. and Surg. Journ.*, 1885, Aug. 13th, 147. Bidder, E.: "Gratulationsschrift z. 50jähr. Doctorjubiläum." Berlin, 1884.

It happens about 1.26 times in every 100 vertex presentations that in the course of labor the occiput does not rotate to the front but to the back, and escapes over the perineum. In most of the cases where, primarily, the occiput was directed more posteriorly, a rotation occurs, notwithstanding, to the front. Any deviation from this rule is not to be explained by an original position of the back of the child to the posterior part of the uterus; for, as the back remains turned to the side when the occiput returns anteriorly owing to the mobility of the neck, so it maintains its position when the occiput rotates posteriorly. There exists, then, no change in the position of the child, but its unusual passage through the pelvis is to be designated merely as a variation in the mechanism of head presentations.

Its causes may lie either in an absence of, or in an abnormal size of that obstacle which normally stops the head in its further progress and directs it to the front. Such an absence or deficiency may be met with in very large pelves or very small children.

This obstacle becomes abnormally great if strong uterine contractions press the head too rapidly and too firmly against the point in question. This may likewise be produced, with otherwise normal obstacles, by a faulty position of the parturient, whereby the occiput is pressed too strongly against the side of the pelvis, as when an improper lateral position has been assumed. An extremely pendulous abdomen may produce the same effect. This rotation frequently occurs at or just above the spina ischii. If the head is forced in a transverse position rapidly down into the pelvic strait, and its progress is completely stopped by its occiput striking against the spine, the latter prevents it from passing any deeper. The brow then advances deeper by reason of the pains, the large fontanelle comes within reach and glides anteriorly over the opposite spina ischii, because there is more room here; the occiput now having become disengaged from the spine, glides posteriorly.

FIG. 35.



Second Occipito-posterior Position.

In this variety of cephalic presentation we must distinguish two different forms of mechanism, especially one where the obstacle is abnormally small. In it the chin, during the rotation of the occiput backward, remains close to the chest, and thus, as in the ordinary mechanism, the parts around the small fontanelle are the deepest; those around the large fontanelle are pressed under the symphysis, and then begins the rotation of the head about its transverse diameter. By this means the occiput escapes over the perineum, and finally the brow from under the symphysis. These are the cases in which only the hairy scalp is to be seen in the vulva during the delivery of the head, and the escape of the brow from under the symphysis often occurs very rapidly. In these the same circumference of the skull passes through the vulva as in the ordinary anterior position. The mechanism assumes an entirely different course if an unusually large obstruction causes this uncommon mode of delivery (Fig. 35). Then a rotation of the head about its transverse diameter occurs at or just above the pelvic strait, by which the brow descends deeper. The larger fronto-occipital circumference, which measures 34 cm., thereby becomes the presenting one, and besides a rotation of the head about its perpendicular diameter follows whereby the brow comes to the front. As a result a second rotation about the transverse diameter occurs, by which means the brow becomes wedged under the pubic arch and the occiput sweeps over the perineum. The face, which at the beginning was turned upward, then rotates to one thigh of the mother, because of the shoulders entering the pelvis, and the latter escape in the antero-posterior diameter of the pelvic outlet.

The occiput remains posteriorly more frequently when directed to the right than when directed to the left.

I found among 105 occipito-posterior positions, only 47 directed to the left, but 58 to the right.
40 of the mothers were primiparæ, 48 (II–V) pluriparæ, 16 (VI–XI) multiparæ; the latter, therefore, were quite numerous.
9 cases of pronounced pelvic contraction occurred among them; these were: 1 obliquely contracted kyphotic, 1 obliquely contracted, 1 symmetrically contracted and 1 lordotic-displaced pelvis.
In 2 cases, the shape of the uterus was faulty, in one of these by myomata.
Of the labors, 7 were immature and 12 premature.
Of the children, 12 were twins, being 10 times more than usual.
Of the fully-developed children, 14 were small, 12 of medium size, 25 large and 10 very large; that is to say, the obstacle arose in one-third of the cases from the child.
The twisting of the cord around the child occurred no more frequently than is usually the case.
Prolapse of the extremities of the cord occurred in about six per cent.; prolapse of an arm, four times, of the cord, twice.
Placenta prævia occurred twice, hydramnios also twice, and eclampsia three times.

These facts prove sufficiently that a large portion of these deliveries are certainly to be designated as pathological.

The heads of the children born in this manner are easily distinguished from those born in the first or second vertex positions. The head appears brachycephalic, with a sharp forehead, and the caput is found on the hairy portion of the scalp over the frontal bone or around the large fontanelle on the anterior extremity of one parietal. If it is more on the left side, the case was originally a second vertex; on the other hand, if more to the right, it was a first vertex.

Bidder's division is decidedly too complicated, and is not free from confusion between the presentation and position of the child. He distinguishes four positions in which the occipital region is the presenting part, and of which two are anterior and two posterior positions. In the latter case the brow remains stationary behind the symphysis until the occiput has described an arc through the pelvic cavity and outlet and is born. He designates as frontal presentations the two which have already been described by me as abnormal mechanisms of labor, while the mechanism of his first and second frontal positions is said to be as follows: The large fontanelle stands in the curve of the true pelvis and remains in it, and at the time of the escape of the head the occipital protuberance is fixed behind the symphysis, until the brow glides over the anterior border of the perineum. At this moment the occiput becomes free and the face appears over the posterior commissure.

Bidder found such frontal presentation only once in 465 births, which was directly opposed to Fritsch, who found it three times as often with contracted pelves, or at least with symmetrically narrowed pelves.

In general, he found them especially frequent with broad, large pelves. Slight differences in pressure which the head meets at different points, moderate irregularities of the side walls of the pelvis, transverse contraction of the lower section of the pelvis, a rounded child's head, a small brow and a broad occiput, are all said to be of importance in the causation of this abnormal mechanism.

CHAPTER VII.

Face Presentation.

LITERATURE.

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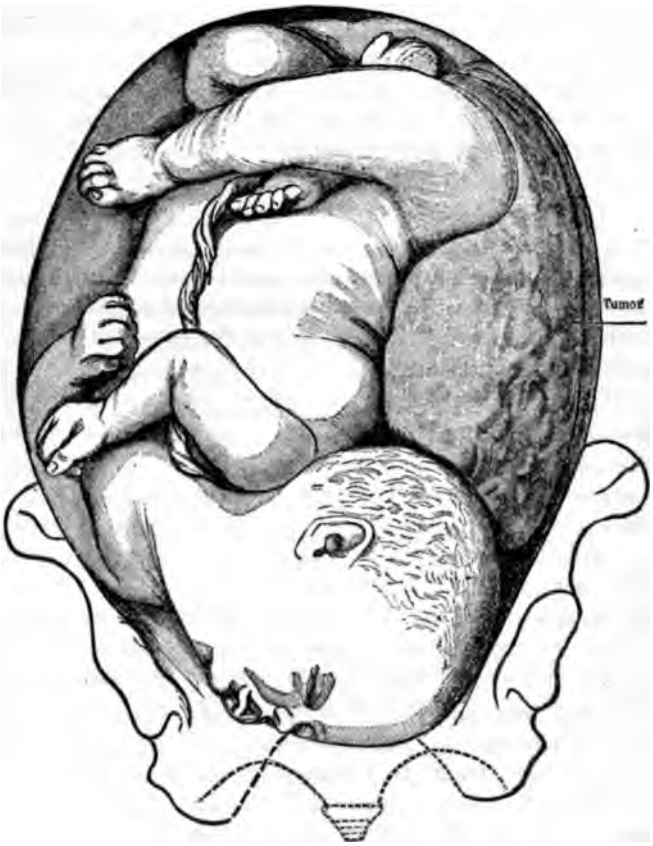
History.—Moschion (100–150 A.D.) recognized a situs in dentes; Roesslin (1513) also describes it. Louise Bourgeois cautions against mistaking it for a breech presentation.

Definition.—In face presentations the normal relation of the head and neck to the body is so changed that the face is separated from the chest, the neck is convex anteriorly, and the face is the part which lies deepest in the uterus. Since it is a question of a faulty attitude, of a deflection, which, for the most part, arises from a vertex presentation, it should not be classified among faulty presentations, but among faulty attitudes of the child. They are, however, designated by everybody as face presentations, and since the term is not likely to be misunderstood, we will retain it, with this addition, that they are rarely to be reckoned among the labors which of themselves terminate favorably.

FIG. 36.

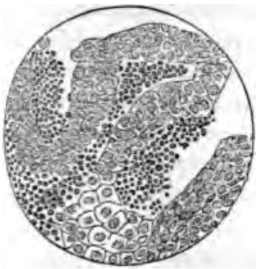


First face position with large child and pedunculated tumor, the size of a pumpkin.

Diagnosis.—By palpation we find the back extending obliquely from on one side above to the other side below, and the extremities are closely pressed against the uterine wall. The shape of the uterus is somewhat like an hour-glass; the fundus lying slightly to one side. In some cases we can feel, at the spot where the chin lies, a prominence on the uterine wall like an animal's hoof (*Budin*). The heart sounds are not heard on the side where the back is, for this is pressed away from the wall of the uterus by the occiput which has been forced against the neck, and the chest is thus crowded closely against the opposite wall. Therefore the cardiac sounds are heard below the umbilicus on the side on which the small parts are found. Fischer succeeded even in feeling, through the uterine wall, the pulsations of the fœtal heart in a face presentation.

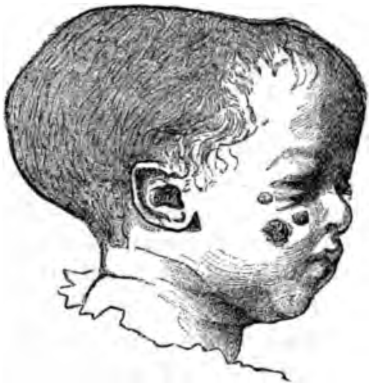
The face is most positively diagnosticated by means of the mouth, which can be distinguished from the other apertures of the body by its size, by the tongue, and usually it is easily found. In the beginning of labor the nose and the nostrils are also easily felt; later, however, they are often difficult to recognize. The same is true of the eyes. Reliance should be placed above all things on the mouth and the tongue and no positive diagnosis made until these have been found.

FIG. 37.



Sarcomatous tumor from the child in Fig. 36.

FIG. 38.



Head of a child born in the first face position with vesicles and wounds of the right cheek.

FIRST FACE POSITION (FIG. 36).

Diagnosis.—The breech is to the left and the small parts to the right in the fundus, the back extends obliquely from the left side above to the right below, and the heart sounds are to be heard below the umbilicus on the right.

The portion of the uterus over the left ilium is rendered prominent by the occiput. At the commencement of labor the vault of the vagina is flat and almost empty, the occiput is felt externally on the left, the face is transversely above the pelvis. The chin is directed to the right and the brow to the left; the right half of the face is presenting.

Mechanism.—At first the chin, by a rotation around the transverse diameter of the face, descends deeper and the face can be readily felt; after which the head rotates upon its long oblique diameter, and the chin advances from the right to the front under the right ramus of the pubes. A second rotation then commences about the transverse diameter of the face, by which means the chin is forced up in front of the pelvic arch, and the brow is pushed down and over the perineum, and thus the chin is brought into closer approximation with the chest. Finally, with the delivery of the shoulders the face rotates to the upper part of the right thigh of the mother (rotation about the long axis of the fœtal body), and at the same time the body escapes with a moderate rotation about its sagittal axis. We find the caput on the right half of the face (Figs. 36 and 38). The brow, the eye, the cheek and the angle of the mouth are bluish-red, and not infrequently covered with vesicles and greatly swollen. Very often sub-conjunctival ecchymoses are present.

SECOND FACE POSITION.

Diagnosis.—The extremities are to the left and the breech to the right in the fundus; the heart sounds are heard below the umbilicus on the left side; the occiput is to be felt above the right ilium, where the wall of the uterus forms a prominence. At the beginning the face is directed transversely, the chin to the left, the brow to the right, and the left half of the face is presenting. The mechanism is just the same as in the first position, only the chin advances from the left side to the front under the pubic arch, and the brow from the right side to the back over the perineum; the face rotates, after its delivery, to the left thigh of the mother.

Among 450 cases I found the brow 246 times on the left and 177 times on the right = 1.4 (I) : 1 (II); therefore, the second face position in proportion to the first occurs more frequently than the second vertex does in comparison with the first. In other words, an obstacle which is capable of converting a vertex into a face presentation is found oftener on the right than on the left.

Etiology of Face Presentations.—Since 1660, more than 200 years ago, the causes of this abnormity have been diligently sought for, and altogether about fifty different ones are believed to have been recognized. However, even now no single cause is proven to be alone sufficient for all cases, and in fact never will be, since such an unusual abnormal attitude and rotation of the child must always owe its origin to a variety of predisposing and accidental circumstances. I shall make mention of only the most important hypotheses which have been advanced, which are the following: violent movements of the mother (*Mauriceau, Lachapelle*); spasm of the uterus (*Roederer, W. A. Freund*); premature or sudden commencement of the pains (*Roederer*); obliquity of the uterus, placenta prævia (*Levret, Hohl*); blind sacks of the uterus (*Wigand*); unusual size of the child's head; primary faulty attitude (*El. v. Siebold*); pelvic malformation and contraction (*Estrich*); lateral pelvic contraction (*Mende*); abnormally strong development of the nuchal muscles of the child;* an inherited disposition on the part of the child to carry the head in a certain position on the neck (*Osiander*); external inclination of the pelvis (*Lange*); round form of the uterus (*Hohl*). In more recent times the theories of Hecker, Freund, Ahlfeld and Schatz have been brought into special prominence. Hecker believed that it was an original faulty shape of the head; the dolichocephalus, in which the occiput became more easily caught and rotated by reason of the lengthening of the antero-posterior diameter. This view undoubtedly in many cases rests on a confusion between cause and effect. The change of the shape of the head is a result of the labor, and the lengthening of the antero-posterior diameter is not even the chief cause; the flattening of the vault of the skull is a still more pronounced, as is also the increase in the transverse diameter (compare Fig. 38).

It is by no means necessary that a face presentation should arise, even if this shape of the skull should have been originally present; for we not alone meet with brachycephalic children in face presentations, but also very many with dolicocephalic heads in vertex presentations. This is perfectly natural, since the anterior arm of the lever always remains the longer, and with otherwise normal resistance the face must approach the chest during the pains. It follows, therefore, that if we are willing to grant that dolichocephalus is a predisposing cause for face presentations, alone it is not sufficient to explain their establishment.

The above-mentioned case of Halliday Croom also shows this; the apparent unusual attitude of the head being corrected by the uterine contractions. An excessive congenital development of the entire occipital region, which was somewhat later asserted by Hecker as a cause, is not to be proven by figures alone, but requires accurate measurements of the circumferences of the separate bones. At my request these have been made by Dr. Benecke on the skulls described by Hecker, and his suppositions have been completely refuted, for the existence of numerous fissures on the skulls in question has added still weightier evidence to the supposition that the changes in the form of the skull arose during the delivery. Freund believes that certain face presentations arise from rheumatism of the uterus, the fibres of the uterus grasping the occiput when it is turned toward them and by drawing it up causing the face to come down. If the abnormal muscular contractions, which are here supposed to be the cause of the extension, were transferred from the uterus to the muscles of the pelvic floor, especially to the levator ani, this view would, according to my opinion, be materially strengthened. Ahlfeld cites a case in which the distended bladder is said to have been responsible for the face presentation. Schatz found in two cases the cause for this presentation in an imperfectly developed shape of the uterus. If the fundus becomes larger than the body of the uterus, not long, but broad, presenting a hollowing out of its base like a saddle, it is then heart-shaped or double-horned. The fœtus is, thereby, pressed together at the end of pregnancy like a bow, and usually flexed on its anterior surface, because its development takes place in this direction; less frequently, and for the most part only temporarily, on its posterior surface; under these circumstances the face presentation is nothing more than this uncommon curvature of the child. It is true that it is not a pure face, but a transition from a brow presentation. As regards the action of the mechanism of labor, over-extension first occurs with the engagement of the chin. Pelvic contraction and a dolichocephalic shape of the skull are said to assist this mechanism. We must admit this manner of the formation of face presentations, only it must be designated, by all means, as a rare exception.*

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* Halliday Croom, in the case of a child who was delivered in the vertex presentation, but had shown a face presentation several days before its birth, found a well-marked extension of the head one month after its delivery and believed that the primary face presentation could have been caused by this, but that it was changed into a vertex by the contractions of the uterus.—*Edinburgh Med. Jour.*, *1880*, Febr., p. 707.

Hoffheinz (Königsberg) found the following etiological factors in 58 face presentations occurring in Königsberg from 1866–1884: a high degree of deviation of the uterus to one side; contraction of the pelvis in the conjugate diameter; a disproportion between the weight and length of the fœtus, in favor of the former; prolapse of a hand along the head; posterior displacement of the arm toward the back of the fœtus; hemicephalus. He questions whether several twists of the cord around the child can produce it. He considers Hecker's theory improbable. Meigs affirmed that dead and half macerated children, who offer scarcely any resistance, were more apt to be born in face positions than living ones. In the latter the separation of the chin from the chest causes a stretching of the head (neck), which is painful, so that the living child instinctively opposes this unusual position by drawing the chin with all its power toward the chest, or by seeking to bend the head forward. Parvin replies to this and to Dr. Hodges' attempts to explain the formation or prevention of face presentations by voluntary movements of the fœtus, that those who have seen how entirely powerless the newborn are to move their heads in any direction, would scarcely concede that the child, against the laws of gravity, could even separate the chin from the chest for one inch, or would be in a condition, if it was forced to one side, to draw back the same with all its power, even supposing that only the slightest amount of resistance existed; I also can fully coincide with this opinion.

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* Kamm (71 cases at Breslau) found 34 per cent. of pelvic contraction; multiparæ 2¼ times more frequent than primiparæ; 39 girls and 31 boys; twice great enlargement of the thorax; dolichocephalus energetically defended; 7 per cent. of mortality for the mother; 17 per cent. of the mothers affected with disease; fœtal mortality 28.1 per cent.; premature rupture of the membranes in 35 per cent. of the cases; 71.8 per cent. spontaneous deliveries; rectification for the most part unnecessary, little chance of success and dangerous (*Centralbl. f. Gynäk.*, 1879, p. 402. In.-Diss.).

Spiegelberg observed a case of face presentation with hydrothorax. In other cases tumors of the child's body were the cause. A short time ago my collection was increased by the addition of a fully developed dead child, which, born in a face presentation, had a pedunculated tumor in the sacral region the size of a pumpkin (cysto-sarcoma, see Figs. 36 and 37). In all probability the explanation of this face presentation appears to me to be the following: As soon as a uterine contraction acted upon the tumor on the back of the child, it drew the breech backward, while the mass of the tumor, lying behind the back, pressed the breast against the opposite wall of the uterus. The body, therefore, became convex on its anterior surface, and the conversion of the head from a vertex into a face presentation was brought about. I cannot believe that the tumor was situated between the thighs, anteriorly over the belly, as the physician in attendance would have it, because it had, from its size, already existed for a long time and the child was very strong—in fact, fully developed. This would scarcely have been the case if so large a tumor had lain pressed against the belly and the cord of the child. I look upon my case exactly as Lüdicke does upon his, in which, in a first face position, a myoma of the uterus, situated anteriorly in the left wall of the uterus and projecting into its cavity, had pressed upon the back, which lay on the left side, and thus caused the face presentation.

Ahlfeld and also Hewetson found a face presentation with a thyroid tumor of the child. This method of the formation of this anomaly does not seem probable to me, for I have repeatedly seen cases in which the thyroid gland was extensively swollen and undoubtedly in consequence of the face presentation; this swelling disappeared at the same time as the swelling of the face. However, it will have to be conceded that, with large goitres, a displacement of the head to one side and by this means a pressing of the skull against the cervix or the ilium, with its subsequent conversion into a face presentation, is possible. In the case of Hewetson a spasmodic contraction of the muscles of the back of the neck is said to have been present. Since the conversion of a vertex presentation into a frontal or even into a brow presentation can occur in the neighborhood of the spina ischii, it is also possible that, where the head is not too large and is just above the pelvic strait, rotation may take place and a face presentation arise from a deep transverse position of the head.

The following factors, according to my experience, are of importance in the explanation of face presentations:—

Among 3.5 cases pelvic contraction occurs once, in other words, the latter is met with almost three times more frequently in face presentations than at other times.

According to clinical experience, face presentations are just as frequent in primiparæ as in multiparæ.

The children are generally larger and stronger than ordinarily—average length 49½ cm., weight 3030 gm.; face presentation—average length 50 cm., weight 3180 gm.

In 22 per cent. of face presentations a twisting of the cord around the child is found.

In 13 per cent. of the cases a faulty attitude, especially the prolapse of a hand, can be made out.

In 30 per cent. of the cases the amount of the liquor amnii is excessive or very great.

In 31 cases at the clinic in Dresden, the presentation of the face could be made out only after the commencement of the pains, frequently, however, not until rupture of the membranes had occurred, shortly before the termination of the delivery.

The frequency of face presentations is variously estimated: Depaul found 1 : 175, Author 1 : 208, Mad. Lachapelle 1 : 217, Churchill 1 : 231, Pinard 1 : 247, Hodge 1 : 250–300, Galabin 1 : 276.

As a rule it is not one alone, but a variety of anomalies which, taken together, are responsible for the origin of face presentations.

For example: contracted pelvis; excess of liquor amnii; at the commencement slight, later sudden and very severe pains; or a large child; movable position of the child above the pelvic inlet; faulty position of the woman, etc. In short we find most frequently a contracted pelvis, a large child and a pendulous abdomen present. I have analyzed accurately observed cases in this connection in my work which has been repeatedly referred to (pp. 116–129).

The predisposition to face presentations lies either in the mother or the child, often in both, but not in climatic or telluric influences; for we find them alike in the North and in the South, in the East and in the West.

CHAPTER VIII.

Pelvic Presentations. Breech. Foot. Knee.

LITERATURE.

Hecker: *Klinik*, 1, 68. Küstner, O.: "Steiss- und Fusslagen, deren Gefahren und Behandlung." Sammlung Klin. Vorträge von Volkmann. Nr. 140. Naegele, H. F.: "Die Lehre vom Geburtsmechanismus." 1838. Osterloh: In Winckel, "Berichte und Studien," 1.

Diagnosis.—We find a large, hard, round body, for the most part to one side of the fundus uteri, and do not perceive any small parts by the side of it, but these are felt lower down and apparently not connected with it. The shape of the abdomen, particularly the uterus, deviates somewhat from the usual, in that the side of the fundus in which the head is, is more rounded and projects further forward.

The breech remains often a long time, even to the beginning of labor in primiparæ, at the pelvic inlet. This is explained by the pressure of the fundus on the head, by which this is pressed to one side, and the breech is thereby deflected to the opposite side. The vault of the vagina is, therefore, for a long time empty, or we feel only the small parts as they glide over it.

During the delivery the membranes are broad and are "pudding-shaped" (*Parvin*). The breech is softer than the head, has no sutures, fontanelles and hair. The anus is the most positive thing to base a diagnosis on and is distinguished from the mouth by its small size. If the child is alive, it offers some resistance to the introduction of the finger by reason of its size and the contraction of the sphincter: "it bites." Moreover, some meconium often escapes during the examination. The position of the breech is most positively diagnosed from the position of the coccyx in relation to the anus, more rarely from that of the genitals to the latter. These may become so swollen that their shape is unrecognizable, and it has happened that the tumid scrotum was mistaken for the sac of a second child. The scrotum may also be forced up so that it cannot be felt. If the breech alone presents, we speak of a simple breech presentation; if one or both feet are alongside of the breech, of a mixed or breech-foot presentation; if the feet alone are to be felt, of a simple footling presentation. Since, however, these variations are of no particular importance for the mechanism of labor, the general expression, pelvic presentation, is the most serviceable.

Varieties.—The back of the child, as in all other fœtal positions, is usually turned to one side of the uterus, neither to the front nor to the back.

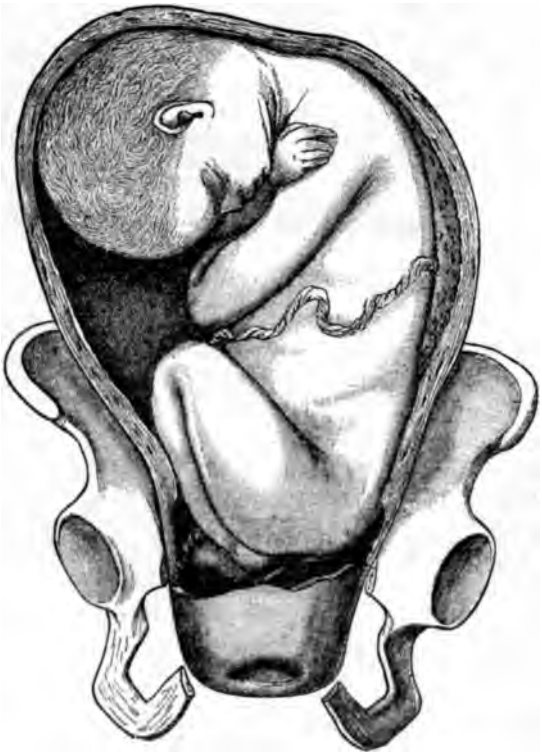
Hecker found among 79 breech presentations:—

			First.		Second.
	46 first position;	33 second position,	= 7	:	5
I found among 205 :—					
	109 first position;	96 second position,	= 6	:	5
	155	129	= 1.2	:	1
K. Schroeder,			1.47	:	1

The second breech position is, therefore, much more frequent in comparison with the first, than the second vertex with the first.

According to Pinard, pelvic presentations, with the exception of those occurring with imperfectly developed fœtuses, are found only once in 62 births: in general, however, they occur in from 3 to 5 per cent. of all births.

Fig. 39.



First Breech Position.

FIRST BREECH POSITION (FIG. 39).

Diagnosis.—The head is felt on the right in the fundus; the back is on the left side of the mother; the heart sounds are heard on a level with or just above the umbilicus, about in the middle line. Internally, the anus is felt in the middle of the pelvic inlet; the anal groove is transverse or in the first oblique diameter; the transverse diameter of the hip is, therefore, in the second oblique. The left buttock is anterior and presents.

Mechanism.—The first rotation occurs around the antero-posterior diameter of the fœtal pelvis, the presenting hip descends deeper. The second rotation takes place around the long axis of the body, whereby the left hip, lying in front on the right side, comes down under the symphysis. A third rotation about the antero-posterior diameter of the fœtal pelvis brings the right hip over the perineum, the left one being pressed against the rami of the pubes. By this means the breech and the body are forced through the external genitals in a direction obliquely to the front and upward. First one knee and then the other escape slowly alongside of the body, or these are forced up through the cervix or the external genitals by the passage of the breech. The attitude of the child in utero is usually the normal one, up to its passage through the cervix; exceptionally the attitudes which are illustrated in many text-books occur, in which the child has its feet completely extended in utero.

After the feet, the arms, which lie upon the breast, slip down; the anterior and upper one first, then the posterior, or even both together; in that case the elbows appear first. A rotation about the long axis then commences, the head, which at first entered the pelvis transversely, being now rotated with its face to the rear; the latter finally passes over the posterior commissure by a rotation around the transverse diameter of the fœtal skull, while the occiput appears under the symphysis. The tumor (caput) is found on the back of the left buttock and on the external genitals.

SECOND BREECH POSITION (FIG. 40).

Diagnosis.—The back of the child is on the right side of the mother, the head to the left in the fundus; the heart sounds are heard on a level with or above the umbilicus, somewhat to the right of the median line, more at the lateral wall of the uterus. Internally, the coccyx is found on the right, the anus a little to the left of the middle of the inlet, the anal groove in the second and the transverse diameter of the fœtal hips in the first oblique diameter. The right buttock is the presenting one; the fœtal tumor develops, therefore, on it and the genitals.

The mechanism in this position is just the same as in the first, as regards the number and kinds of rotation, only the right hip comes under the arch of the pubes and the left passes over the perineum; later the abdomen rotates from the left toward the back. The delivered breech exhibits a swelling on the back of the right buttock.

Abnormal Mechanism in Breech Presentation.—In the case of small children, or a large pelvis and very rapid delivery, the first breech position may be converted into the second, and *vice versâ*. In fact, even after the

Hecker found among 79 breech ...

46 first ...

I found among 205 :—

100 first ...

155

K. Schroeder, ...

The second breech pos... son with the first, than ...

According to Pinard, ... occurring with imperfe... births: in general, how...

... anteriorly, the head and ... and the face escapes over ... rotate posteriorly after ... occiput escapes first over ... behind the symphysis ; and ... footling presentations arise ... down of the feet : knee ... of the foot, an obstruction ... presentations occur only ... ations. Footling and knee

... Their movements depend solely

... joints of which are all in a row, ... so strongly as can the thumb. ... which appears as an isolated ... by a tumor, and is also not hard

... presentations, we know that, up ... almost as frequently as the vertex ... there were :—

Diag... left side ... above ...

. . 40	= 26.5 per cent.	
. . . . 35	23.5	"
. . . 75	50.0	"

that they are met with more frequently in twin pregnancies (14 : 150) 18 : 57 (Munich), and with hydramnios than at other times, and finally that, with a faulty shape of the child (hydrocephalus and hemicephalus), with cystic kidneys and with dilatation of the bladder, they are about ten times more frequent than usual. We know, also, that they occur more frequently in multiparæ than primiparæ, that 19 per cent. of all fœtuses born in a pelvic presentation are macerated, and 28 – 33 per cent. of all macerated fœtuses are expelled in a pelvic presentation. Twisting of the cord around the neck (27 : 150), and around the breech (2 : 150), occurs, less frequently in pelvic than in vertex presentations. Primary faulty shape of the uterus, as uterus bicornis and unicornis, tumors of the uterus, and placenta prævia are also to be mentioned as frequent causes of these presentations.

The uterus appears throughout as the principal factor in defining and regulating the position, and everything depends on the condition of the lower uterine segment; the less this is developed the more likely is it that the pelvic presentation will persist.

Simpson, for example, found among 360 cases of placenta prævia 39 breech presentations, instead of at the very highest 14 – 15; this is more than twice the usual number. Süsserot found among 140 cases of myoma in women during delivery, 16 pelvic presentations or 23.5 per cent.; but it must be stated that the fœtal positions had only been noted in 68 of the cases.

In Munich there were found among 2181 fœtuses 94 pelvic presentations = 4.3 per cent., 37 girls, 36 boys, after deducting the twins and macerated children and one anencephalous child, 55 : 2035 = 2⅔ per cent.

With fully developed children primiparæ, 1 : 80.
" " " " pluriparæ, 1 : 75.
" " " " multiparæ, 1 : 23.

(Thus the multiparæ are most predisposed.)

At the 5th month	5 pelvic presentations to	4 vertex	= 55. per cent.
" 6th and 7th month	8 pelvic presentations to	17 "	= 42. "
" 8th and 9th	" 6 " " "	73 "	= 18. "
" 10th	" 9 " " "	203 "	= 4.5 "
Full term	27 " " "	1681 "	= 4.25 "

CHAPTER IX.

Prognosis of the Different Presentations.

LITERATURE.

Kohen: *Centralblatt f. Gynäk.*, 1884, p. 285. Kleinwächter: *Zeitschrift f. Geburtsh. und Gynäk.*, 1884, Bd. XI, Heft I.

The first vertex presentation is the most favorable, inasmuch as the roundest, hardest and largest part of the child, with its smallest circumference, 32 cm., passes through the cervix and the external genitals. Its greatest diameter which passes through the external genitals, the small diagonal, is 9.0 cm.

In this respect the second cranial position is just as favorable as the first, but the occiput sometimes remains turned backward, and deviations from the normal mechanism of the passage of the cranium easily occur. When the occiput does go to the rear, the prognosis is not so favorable as in the ordinary mechanism where the occiput rotates to the pubis. The broad occiput must pass over the perineum, but this evil is sometimes corrected by the occiput rotating to the front and the small circumference of the head then passing through the outlet.

When the occiput remains at the rear, a long diameter, occipito-frontal, 12 cm., and a large circumference, occipito-frontal, 34 cm., must pass through the cervix and outlet, consequently internal or external lacerations are apt to take place. More than this, the flat surface of the forehead, which is continuous with the face, does not engage so readily at the symphysis, or pass so easily under it, as does the occiput. For these reasons such labors are apt to be more tedious. The long duration of the labor also renders the prognosis bad for the child. The mortality of the children in the first and second vertex presentations is 2.5 per cent., while in deviations from this mechanism it is considerably greater; over 15 per cent in mature children, according to my experience. The uterus ruptured in two of the cases and in twenty the forceps were used.

Face presentations belong really to normal labor, for they do not, as a rule, last much longer than vertex presentations (*Hecker* and *Walther*, in primiparæ, 1st stage, 22.4 hours; 2d stage, 1 hour and 12 minutes: in multiparæ, 1st stage, 9 hours; 2d stage 55 minutes), but the displacement of the occiput increases the strain upon the corresponding side of the uterus, and the pain is greater; moreover, the sharp prominences of the child's face may cause considerable bruising of the bladder and vagina, and, perhaps, even lead to vesico-vaginal fistula. Furthermore, the occipito-frontal circumference which passes through the outlet, being always longer (according to Torggler) than the suboccipito-bregmatic circumference (about [illegible] longer), while its diameter is from 1.08 to 1.90 longer than the sub-occipito-bregmatic), rupture of the perineum is more liable to occur in face than in vertex presentations. This presentation, however, is much more dangerous for the child, owing to the compression of the neck and external jugular veins, and the hyperæmia of the head caused in this manner may lead to apoplexy. When the chin of the child is jammed against the pubic arch, compression of the internal jugular also occurs. In 455 recorded cases, 13 per cent. were born dead and 7.5 per cent. in an asphyxiated condition, which bad result is also to be ascribed, in part, to the frequent occurrence of contracted pelvis, the dislocation of the bones of the child's head, the frequent prolapse of small parts, the occasional premature rupture of the membranes, and especially the liability to coiling of the cord around the child, which often exists in face presentations. The excessive swelling of the lips and tongue causes difficulty of swallowing and breathing after birth, but in most cases it passes off quickly.

From these statements it is readily seen that the prognosis in occipito-posterior positions and face presentations is about the same, and that they are sometimes not to be classed under eutocia, but more often under dystocia.

Breech presentations are likewise more unfavorable to both mother and child than head presentations. Unfavorable to the child in the first place, because the insertion of the cord into the abdomen is very near the cervix, and there is danger of its compression at an early period; this may also take place when the breech reaches the floor of the pelvis, but is sure to obtain when only the head and placenta remain within the uterus, as the hard head does not yield to the cord. For this reason, and also because the inevitable chilling of the child's body irritates its skin, and causes premature respiration, and inspiration of vernix caseosa and amniotic fluid, the child is usually asphyxiated when born, and often cannot be resuscitated. In 412 breech cases, 49 children, or more than 11 per cent., were born apparently dead; three times as many as in vertex presentations. Furthermore, prolapse of the funis is frequent, especially in footling presentations (one in 14), and this endangers the life of the child. The prognosis in simple breech cases, *i. e.*, where the feet are drawn up close to the body, is better, because the complete presentation of the breech dilates the os and the external genitals to a greater extent, and better prepares the way for the passage of the head. Incomplete footling presentations are therefore more favorable than complete cases. The prognosis of breech cases may be inferred from the fact that 24 per cent. require assistance from the obstetrician. Hecker rates the mortality of the children at 26 per cent., Ohnerhill at 31 per cent., and Dubois at only 9 per cent. According to Bell, in breech cases, almost 22 per cent. of the children are born dead (519 : 2367). In 54 cases (43 breech, 11 footling) 16 per cent. of the children were born dead and 3⅔ per cent. died subsequently, making in all 19.6 per cent.

CHAPTER X.

Labor in Multiple Pregnancies.

LITERATURE.

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In case of twins, two head presentations are most frequent (40 per cent.); the first twin in head position and the second in breech position comes next to this (27.5 per cent.); then both children presenting by the breech (13 per cent.); next the first a breech and the second a head position (9 per cent.); the remaining cases are irregular. According to Kleinwächter 69.58 per cent. were head, 25.25 per cent. breech, and 5.17 per cent. transverse presentations. In more than two-thirds of all cases of twin pregnancy, labor begins before term. The birth of the first twin is usually protracted, owing to the marked distention of the uterus and to the fact that the fundus cannot bring its force to bear directly upon the long axis of the first child, and probably also because labor so frequently commences before term.

Sometimes one of the twins tries to take precedence of the other, both of the membranes protruding at the same time, and the presenting parts pressing forward and receding again. The birth of the second child is usually more rapid, occurring as a rule about an hour after delivery of the first, even though this may have been very tedious. Sometimes, however, an interval of 24 hours, or even several days, may elapse. In 1487 cases in Saxony (1883) the interval was as follows; birth of the second child occurred immediately 364 times. The pause was:—

¼ hour	in	386 cases.	½ to ⅓ hour	in	52 cases.
½ "	"	301 "	¾ to 1 "	"	156 "

Hence 1259, or 84.6 per cent., were delivered in one hour after the birth of the first child. In the remaining 228 cases, or 15.4 per cent., the second birth followed in from 1 to 22 hours later. The presentation of the second child is more often defective and abnormal than that of the first, and complications are more likely to occur when it engages, as prolapse of some of the small parts of the cord, or even the occurrence of hemorrhage.

The mortality of twins, ***sub partu***, is 7.2 per cent. (*Geissler*); is greater in boys than in girls, and attains its minimum when there is one of each sex (4.9 per cent.). It is also greater in primiparæ; this is explained by the tedious birth of the first child and the early occurrence of labor. As a rule, the after-births are not expelled until after the birth of the second child, but exceptionally the first child may be followed by its placenta, or the placenta of the second child may be expelled before the birth of the latter. The prognosis is not so good for the mother as in simple births, and artificial aid is more often necessary. Post-partum hemorrhage also occurs from atony of the uterus in 8.5 per cent. of twin cases, especially as the placentæ are usually larger than simple placentæ, and their lower borders are nearer the internal os. Hugenberger reports the mortality at 7.2 per cent. The percentage, happily, is much better now, and amounts to only about 1 to 1.5 per cent. In 1880, triplets were born seven times in Saxony; 17 of the children were born alive and 4 were dead, thus making a loss of about 23.4 per cent. (*Geissler*). Of 13 triplets born in Saxony since 1883, 3 boys and 8 girls succumbed, = 28.2 per cent. In seven cases the time which elapsed before the birth of the last child was only 1 hour, 2½ hours in four cases, and in the last two 3 and 5¼ hours.

CHAPTER XI.

The Management of Labor. General Directions.

LITERATURE.

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Ninety-five out of a hundred births occur in such a manner that nothing more than a certain amount of care is necessary, and there is no need of interference. The best proof of this statement is given by the fact that in 118,202 deliveries, occurring in private houses in Saxony in the year 1878, only 5845, or 4.9 per cent., required the interference of the physician. At the Hôtel Dieu, in Paris, under the direction of Madame Lachapelle, of 15,652 births only 272, or 1.7 per cent., were ended by artificial means, and 15,380, or 98.3 per cent., occurred spontaneously. Young obstetricians should bear this in mind, and devote as much time as possible to the observation of normal deliveries.

Labor is a natural process and not a disease; it too often results in a diseased condition because of injudicious interference. Normal labor is exceedingly painful and usually accompanied by loud cries and complaints by the patient; there is also a certain amount of loss of blood; sometimes, when the process is of long duration, the persons present, from sympathy for the patient, urge the physician to interfere. The parturient woman may be profuse in the utterance of such remarks as "I can do no more; I am dying; I am completely exhausted; my pain is insupportable."

Unfortunately, many young physicians who are called in to assist the parturient woman have had little or no opportunity for gaining information of the normal process of labor from their own observation. Their presence at three or four labors cannot qualify them to form an opinion as to the normal course of a process which is liable to so many variations. How large is the number of students who, without being directly employed in the delivery of a parturient woman, are content simply to observe the course of normal labor? On the other hand, many have a strong feeling that their exercises upon the phantom have insured them great familiarity with operative obstetrics. The physician who approaches the bed of a parturient woman should not only have a certain amount of experience, good judgment and precision, but he must act according to definite fundamental laws, without which he can only do harm to the two beings who require his help. We will, therefore, consider, in the first place, those general fundamental laws, to the observance of which every physician is pledged. First of all, he should employ the strictest antisepsis in all that he does. His own person, his hands, his instruments, the nurse, the parturient woman, and even the surroundings should be carefully guarded against contagion. The physician should not go to a case of labor from the post-mortem table or from a case of diphtheria or scarlatina, without first completely changing his clothing and disinfecting his hands, beard and garments until there is not the faintest trace of odor. He should never come in contact with the parturient woman without first thoroughly washing his hands with an appropriate solution of corrosive sublimate (0.5–1 per cent.). This, of course, also applies to the nurse and to everything which is employed in labor: scissors, bandages, napkins, catheters, vaginal douche nozzles, absorbent cotton, etc., should be disinfected by a 3 per cent. solution of carbolic acid. Relatives or nurses who have been exposed to infectious diseases (septic puerperal women, scarlatina, diphtheria, erysipelas or septic suppurative processes), must not approach the bed nor enter the room of the parturient woman. The hands and feet of the patient, as well as the external genitals, should be washed in the same solution of corrosive sublimate, and whenever there is a foul smelling or even simple suppurative discharge from the vagina, an injection of corrosive sublimate in solution (1 per cent.) should be employed. Having made these preparations, the next duty of the physician is to make as exact a diagnosis as possible; and this must include the following points, viz., whether the membranes have become detached; the stage of the labor; which part of the child presents and its relation to the pelvis; the condition of the soft parts; whether the bag of waters is still intact, or whether a caput succedaneum has formed; and, finally, what the measurements of the pelvis are. The woman's condition should be determined by observations of the pulse, respiration and temperature, as well as the sensitiveness of her parts; while the state of the child is indicated by the caput succedaneum, the condition of the sutures, the quality of the amniotic fluid, the number and strength of the heart sounds and the movements of the child. The obstetrician should never forget the importance of an external examination and the auscultation of the fœtal heart.

Having made the diagnosis, the course of the labor should be observed, *i. e.*, the strength and frequency of the pains should be tested by the hand and the watch, as well as their action upon the bag of waters, the advancement of the child, the tension and dilatation of the external os, and the movements of the child, etc., for upon these observations the prognosis is based. Not until he has fulfilled all these indications is the physician in position to apply the measures required by the condition of the parturient woman and her child, which measures apply to the room, the bed, surroundings, clothing, movements of the woman, the food and drink to be allowed her, and her general behavior otherwise. He should inform the patient of the presentation of the child, and the stage of labor in which she is found; furthermore reassure her as to certain fears, warn her of the approaching rupture of the bag of waters, and advise her as to her behavior during the pains.. He will always be asked how long it will be before the labor is over, and although a definite answer is not always possible, at the same time he should not cruelly leave the woman in uncertainty by remarking that it is impossible to say when it will be over. Of course, it is impossible to determine this to a quarter or a half of an hour, but one may often come within an hour of it, and I have often found that this knowledge will quiet the woman unless too short a time is stated. Slight irregularities should not be mentioned to the patient or the family, but impending danger, whether immediate or prospective (indicated by slowing of the fœtal heart, discharge of meconium, or rising temperature of the mother), should be communicated at once to the husband or nearest relative.

The accoucheur should avoid too frequent unnecessary examinations, and refrain from excessive zeal; neither should the nurse be allowed to detail the tremendous services she has rendered other parturient women. During the first stage the physician should only remain in the room long enough to make his examination and determine the progress of the case, and he should also leave the house from time to time, so that he may be cool and collected when he is really needed. When sent for by the nurse or other person, because of some irregularity, he should not go convinced that some operation must be performed; in a word, he should have confidence in the natural forces. How true Blandell's remark is: "Lead yourselves not into temptation; if you put your instruments into your pocket, they are very apt to slip out of your pockets into the uterus." The midwife has with her the instruments and remedies that are necessary for a normal delivery, and the physician, when he lives in the neighborhood of the patient should content himself with the stethoscope, tablets of corrosive sublimate with chloride of sodium (āā 0.5), and likewise his pocket case for use in the event of rupture of the perineum.

CHAPTER XII.

The Management of Labor. Special Directions.

LITERATURE.

Treatment of Breech Presentations: Münster: *Deutsche Zeitschrift f. prakt. Medicin.* Küstner, see Cap. VIII. Bunge: *Centralbl. f. Gynäk.*, III, 179 (fillet). Hamilton: *Edinburgh Med. Journal*, 1881, Nov. Lusk: *New York Med. Journal*, 1885, Febr. 14th, 177. Underhill: *British Med. Journal*, October 11th, 1879. Rice: "Treatment of the second stage of Labor." *Am. Jour. of Obstetrics*, 1882, Oct., 853. McGauthey, J.: "Support of the Perineum." *Am. Jour. of Obstetr.*, 1884, June, 580. Ch. Green: "Treatment of Twin Labor." *Am. Journal of Obstetr.*, 1884, Febr., 152. Budin: "Obstetrique et gynécologie," Paris, Doin, 1886, p. 1–45. Credé: "Unterbindung der Nabelschnur, *Archiv f. Gynäk.*, XXIII, 1. Credé and Colpe: "Dammschutzverfahren. *Archiv f. Gynäk.*. XXIV, 150. Winckel: "Die Bedeutung präcipitirter Geburten." München, 1884. Reeve (Ohio): see Parvin, "Science and Art of Obstetrics," p. 395.

The lying-in chamber should be as airy and as roomy as possible, and strict attention should be devoted to its sanitary condition; when convenient, it should be removed from the noise of the house and not lighted from the street. All unnecessary furniture should be removed from it. The parturient woman, if fully dressed, should remove all tight clothing and content herself with a wrapper, chemise, drawers and easy shoes. Provided she is in the first stage of labor, an enema should be ordered, in order to thoroughly clean out the bowel. The nurse often neglects this, giving as an excuse that the parturient has just had a passage. Because of the tremendous strain required in the second stage, all unnecessary exertion should be avoided during the first. In the meantime the bed should be properly prepared. Impervious cloth should be laid over a hard mattress and cover a great extent of it, so as to avoid getting it wet, and the sheet used should not be too coarse. The bed should be so placed that the woman may be approached from all sides. The physician will often be asked how the parturient should lie, whether upon the side or upon the back. If the presenting part is already fixed in the true pelvis he may counsel her to suit her own convenience; should there be some irregularity of mechanism, or if the presenting part be quite high and still mobile, the woman's position is not a matter of indifference as regards the mechanism of the labor, and one may often convince himself that the wrong position of the woman may make the normal rotations more difficult, or even cause an abnormal presentation. In such cases she should be advised to lie upon the side containing the part of the child which is first to come downward and forward through the pelvis, *i.e.*, upon the left side in the first vertex position, upon the right side in the first face position. The physician will also be asked whether she should remain in bed or walk about. As a rule, it is well to put all women to bed who have very powerful pains, and forbid them to bear down at this period. If the pains are infrequent, she may remain up until the membranes remain tense during the intervals between the pains, then she should go to bed, in order that the membranes may not rupture while she is up. Having convinced one's self of the complete absence of irregularities in either mother or child, an examination should be made about once every hour, at which time the frequency and strength of the fœtal heart sounds, the nature and condition of the presenting part, the dilatation of the os, the frequency and power of the pains, the pulse, temperature and respiration, should all be noted. The parturient woman should be apprised of the impending escape of the amniotic fluid, so that she may not be frightened unnecessarily by its sudden discharge. As soon as the membranes have ruptured the condition of the liquor amnii (meconium) should be noted, and another examination undertaken in order to ascertain if the cord is prolapsed, or whether some of the small parts have come down alongside the head, and also in order to confirm the previous diagnosis. The attitude and position which the parturient woman assumes at the end of the second stage, from ancient times up to the present day, have varied, not only in different countries, but also in several tribes of the same people.

For instance, the Hindus as well as the inhabitants of Madras and the East Coast, prefer the standing position, supported by female friends or the husband. This is likewise the case with the negroes of the Philippine Islands, with the women of Central Africa and those of the Boërs, as well as many Indians. Formerly, French women were delivered in this position, and more recently the Slavs in upper Silesia. The women of Polynesia, the negresses of Australia, and the Persians (kneeling upon three stones), give birth in the squatting position; while many Russians give birth to the child while swinging and hanging from a beam, and the Brazilians are even tied to a tree. Others hang to a cord suspended from the ceiling. Some English and German women are supported by the husband's arm. In Meeran the parturient woman is suspended by a large, strong towel and allowed to swing about. The Abyssinians, Georgians, Armenians, Persians, Tartars, Mongols, Kamtschatkans, Greeks and Esthuanians all kneel. The Australians, the South Indians and Massauanians are delivered seated on a block of wood; the negroes of old Calabar sitting on a stone; while women in Japan, China, Turkey, Greece, Egypt and Messina prefer the chair. This chair is of very ancient origin and has been used from the earliest Egyptian times up to the present. In old Rome, Holland (*Schootteers*), Germany and among the Bedouins many preferred sitting upon some one's lap. The Brazilian Indians, the women of the Antilles, of the Sandwich Islands, of Sumatra, Australia, Japan, China, Pãon, India are delivered in the recumbent position lying on the side. The side posture is generally used by the Siamese, English and North Americans. Finally, some Italian women raise the body and bend backward so that head and feet nearly meet (*Engelmann*).

In short, there is hardly any conceivable posture which is not preferred by some women, civilized or otherwise, during the stage of expulsion; fashion, the advice of the nurse, the natural instinct or the physician's advice, account for this great difference in postures; moreover, the woman longs for change, and so shifts about from one position to another. If left to herself, the civilized woman goes to bed and takes up the position which seems most convenient to her, either upon the back or side. It is true that many leave the bed at the last moment and crouch or sit upon the vessel in order to satisfy the intense desire to go to stool. Primiparæ whom the labor takes by surprise, who have never seen another woman in labor, not infrequently remain standing, but never go down upon their knees, although they sometimes squat down. Multiparæ also hardly ever kneel, but stand, stoop over, sit down or lie down. I refer, in this connection, to my observations of precipitate labor, where many examples of what has just been said will be found.

The discussion of the question as to the best posture for the woman in labor has been brought up by a layman, von Ludwig. The obstetricians who have busied themselves anew with these considerations, do not mention that Ritgen instituted comparisons, as early as the first half of this century, as to the relative value of the different postures, and came to the conclusion that the knee-elbow position had many advantages. In spite of his recommendation, however, it did not become popular; the observations of Fraenkel-Spiegelberg in the Breslau Clinic show that rupture of the perineum is less liable to occur in this position, but tears at the upper part of the vulva are more frequent than in the dorsal position. In the clinic at Erlangen the principal disadvantage of this position was obviated by raising up the abdomen with a towel so that the proper relation between the uterus and the pelvis was retained, avoiding too great dropping over of the fundus. K. Schroeder, who had formerly recommended the knee-elbow position, has not advocated it in his last work, probably because he no doubt saw that, although the perineum was relieved, the principal expulsive force (abdominal muscles) was not so well exerted in this position, as when upon the back with a moderately elevated body.

During labor, as a rule, the woman has very little desire for food, but usually craves drink, and fresh water may be given her at regular intervals without hesitation, even during the excessive muscular action of the second stage; on the other hand tea and heating drinks should not be given, being only appropriate when the woman is cold or very weak. Besides water, coffee, milk, bouillon, eggs and the like may be taken. The bladder should be thought of and care should be taken to advise frequent urination, so that the second stage may not be interfered with by distention of that organ, which is then not easily relieved, owing to the pressure on the urethra. At the time when the parturient woman, owing to the exertion of bearing down, becomes red and overheated, and especially in summer, when perspiration is very depleting, she may be greatly refreshed by the use of cologne to wash the hands and face, or cold water, or by the administration of peppermint lozenges. Support of the back and massage of the muscles in the case of cramps in the calves of the legs, either with the hand alone or with chloroform liniment (20 : 80 ol. hyoscyami) gives great relief. As regards *vaginal injections*, I can but agree with those authors who have declared them unnecessary and useless in normal labors in private practice, and to be permitted only when abnormal secretion, as suppuration, is present, or in the case of death of the child, or abnormal resistance of the soft parts. In the *hospital*, where so many arrive with catarrh of the cervical canal, washing out the vagina with a solution of corrosive sublimate is the best prophylaxis for the mother and child (against blennorrhagic ophthalmia), and also protects the physician from infection.

As soon as the external os is completely dilated the parturient woman may be allowed to bear down—that is to say, if the long axis of the child corresponds to the long axis of the uterus. In order to make this easier for her, the upper part of the body should be propped up and the feet braced against the foot of the bed, while a cord attached to the footboard allows of her bracing herself with her hands. If the pains are strong and the child is advancing, causing bulging of the perineum, she should not be allowed to avail herself of this aid, in order to prevent the precipitate expulsion of the child. With the same end in view, the lateral position may be recommended, not only because the bearing down is not so marked as it is while lying upon the back, inasmuch as the coöperation of the muscles is somewhat interfered with, but also because a better view is obtained of the perineum. In the lateral position the time is more easily determined at which it is necessary to support the perineum, and the parts are easier of access to the hand. During the second stage, examinations should be frequently made and the fœtal heart watched carefully, especially during the passage of the presenting part through the vulva. One of the most important points in the delivery is the so-called protection of the perineum. If rupture of this body is to be avoided in primiparæ, it should be supported when the head remains in the vulva during the intervals instead of receding, and in multiparæ when the perineum begins to bulge. The idea is, firstly, to prevent the too rapid passage of the head, by holding it back by the hand upon the perineum, and, secondly, to favor rotation of the head upon its transverse axis, by pushing the occiput up against the symphysis, and finally prevent the perineum from gliding down too rapidly over the advancing head.

When so carried out, the protection of the perineum is by no means superfluous, and is not merely made use of because of prejudice, or to satisfy the patient. It may be carried out in three different ways, either in the lateral or dorsal position. In both positions the whole of the hand rests upon the perineal body, reaching forward so that the fourchette may be controlled, for it is here that it usually begins to tear, and its symmetrical recession over the head is one of the most important objects of this act. The French method is the one where the right hand is used when the woman is lying upon the left side, and *vice versâ*. In the dorsal position the hand may either be laid flat upon the perineum, so that the ends of the fingers are at the sacrum and the ball of the thumb and hypothenar elevation are at the fourchette, the hand following the perineum from above, downward and backward, or the thumb is placed upon one of the labia majora and the rest of the fingers cover the perineum at right angles with it. Ritgen's proposition to apply external pressure just in front of the apex of the sacrum or behind the anus, in order to push the head against the symphysis, is well worthy of commendation and has been justly reintroduced by Fehling. Siebold, and more recently Playfair, advised a similar procedure, which consists of lengthening the perineum by pressure from the side and behind forward, thus diminishing the tension and increasing the elasticity of the part.

The attempt at protecting the perineum from the rectum was not original with Ritgen, but, as Parvin has shown (*l. c.*, p. 409), was introduced by Smellie, who advised the introduction of two fingers into the rectum at the end of a pain, and then pressing the forehead up and away from the perineum, thus pushing the occiput against the symphysis. Parvin also mentions that Nicolo Bernati, in 1778, protected the perineum in the same way, by introducing one finger into the rectum. Goodell's method is different; here one finger is hooked into the rectum, thus pulling the perineum forward, while the thumb holds back the head; but Duncan has proven that this lacerates the mucous membrane of the rectum considerably, and that it may cause recto-vaginal fistula. On the contrary, the method of Smellie and Ritgen is the most acceptable in abnormal cases, especially in cases of weak pains at the end of the second period. If there be syphilitic ulcers on the perineum, the rectal method is indicated.

Furthermore, perineal tears may not infrequently be avoided by simply holding back the emerging head during the pain, and hooking the forefinger into the depression of the anterior fontanelle, and thus swinging the occiput up around the symphysis. The most important point is not to abandon the perineum at the moment the head sweeps up over it; on the contrary, the hand should glide down with it over the head. As soon as the head is born the hand may be removed, but laid on again as soon as the next pain begins to show itself. After the passage of the head the hand should be immediately thrust in beneath the symphysis in order to feel whether the cord is around the child's neck; if this is not the case, the next pain should be quietly waited for, and the mucus removed from the child's mouth. If the pause seems too long, friction should be applied to the uterus, in order to excite a pain. If the cord is felt around the neck, an effort should be made to draw it down and pull it over the head, and then to push it back to the posterior shoulder, as there is more room for it there between the body and the soft parts. If the coil is too tight for this, the posterior shoulder should first be rapidly felt for and the cord then cut with the scissors at the neck, and extraction of that shoulder is now undertaken, by hooking the index finger of the opposite hand into the axilla with the middle finger on the upper arm and the thumb upon the shoulder, and then pulling the child out while the other hand directs the head somewhat upward. Protection of the perineum is not especially necessary here. If the shoulder is delivered spontaneously, however, it must be protected as soon as the next pain begins. The body should be raised up slowly in order to relieve the perineum of its weight.

These rules apply to all the presentations in common, but in special cases other appropriate measures are necessary. In the first place, in posterior vertex positions, rotation of the head forward should be favored by decubitus upon the side toward which the occiput is directed. The central part of the perineum is the most endangered, and should receive special support. In such cases pressure upon the occiput from the rectum may facilitate the revolution of the large fontanelle away from the symphysis and thus relieve the perineum. In face presentations, great care should be taken to avoid the rupture of the bag of waters during the examination of the woman, so that it may be preserved intact as long as possible, in order to avoid injury to the eyelids; and furthermore auscultation should be frequently practiced during the second stage, in order to be of assistance at the critical moment. Moreover, the perineum must be carefully protected, taking care, however, to avoid too much pressure upon the neck at the symphysis.

In breech cases, we must preserve the bag of waters as long as possible and listen to the heart sounds frequently and make all necessary preparations for extraction, but be careful to avoid premature traction upon the breech, as the arms may easily pass up above the head. As soon as the breech appears, the woman should be placed across the bed, and when it is born, the cord should be felt for along the side of the abdomen, in order to ascertain if it is exposed to pressure; if so, it should be pulled down with the thumb and first finger. If the feet are high up, they should not be brought down, but they as well as the arms should be allowed to come down gradually. As soon as these have appeared, the chin should be felt for quickly and the presence of the head in the true pelvis confirmed, for it is a question of minutes now, so far as the life of the child is concerned. It is well at this point, as soon as the arms are born, to grasp the fundus firmly in order to excite contractions, and follow it down with the head into the pelvis. If the head does not shortly appear, it must be extracted at once without loss of time; we will return to this in a subsequent chapter. The cord is cut as soon as the child has cried lustily and its pulsations have grown weaker or ceased entirely. By this means, according to Budin, the child gets 92 grams more of blood, partly owing to the aspiration of the lungs and partly due to pressure upon the placenta. The cord is tied with two turns, about 8 cm. distant from the navel, then cut and tied again. A third ligature is placed close to the external genitals of the mother. This double tying of the cord is to keep the blood in the placenta, thus leaving it larger and more easily detached, and also in order to protect from hemorrhage the second child, in case one should be present. Furthermore, the descent of the placenta may be noted by the position of this third ligature. According to Budin and Credé, a piece of rubber 2 cm. thick should be used for the ligatures, because it is especially adapted to the ligation of points where there is an excess of Wharton's gelatin, and is much better than silk, hemp or linen in this respect, because it avoids the risk of secondary hemorrhage. The cord is laid upon a looped ligature formed of a piece of solid rubber or drainage tube 20 cm. long. The ends of the latter are passed through the end of the loop over the cord and drawn up tight, passed around the cord in opposite directions and knotted securely. The stump upon the child's abdomen should be dressed with ordinary cotton, laid to the left side and held in place by the abdominal bandage. The cotton prevents the admission of germs from the air, and does not permit of displacement of the end of the cord. The mother is only about half delivered when the child is born, and we should not neglect her at this time, for she may be in the greatest danger in a few moments, owing to the occurrence of post-partum hemorrhage.

CHAPTER XIII.

The Use of Anæsthetics in Labor.

LITERATURE.

Winckel: "Von der Einwirkung des Chloroforms auf die Wehenthätigkeit." *Monatsschr. für Geburtsk.*, XXV, 241, 1865. Hofmeier: "Der Icterus der Neugeborenen." Haeckermann: *Zeitschrift f. Geburtsh. und Gynäk.*, Band X, I. Winckel: *Centralbl. f. Gynäk.*, 1882, p. 120. Tittel: *Centralbl. f. Gynäk.*, 1883, p. 166. Döderlein: *Archiv f. Gynäkol.*, XXVII, 1885. 328. Juhl (Lette): Inaug.-Diss. München, 1887. Kiener: "Elektricität als wehenschmerzlinderndes Mittel."

There is still another question which comes up in the treatment of normal labor, namely, the use of remedies for the purpose of relieving pain. J. Y. Simpson, in 1847, was the first to notice that sulphuric ether lessened the suffering considerably, and in the same year he found this was also the case with chloroform. Dr. Keep, of Boston, and Dr. W. Channing were the first to use ether during labor in America, while Prof. Henry Miller, of Louisville, was the pioneer as regards the use of chloroform. Although Simpson was convinced that the general use of anæsthesia in labor was only a question of time, Ashwell, Tyler-Smith and Ramsbotham combated this view, maintaining that its use was unnatural and harmful, and prophesied that it would soon be abandoned. I have considered this question in detail in my work upon the influence of chloroform upon the pains of labor, and have shown that at the beginning of its use the first pause between the pains is somewhat longer, but that in general the pains are not affected, and that even the bearing-down action continues regularly if chloroform is used and narcosis is not too profound ; moreover, that it is not harmful to the child. I have never seen anæsthesia of the child in a labor where chloroform was used, even when the mother had been under its influence for hours. In the case of a woman who has suffered all night upon an empty stomach, comparatively small quantities are sufficient to stupefy her, so that she only utters an occasional groan and knows nothing of what is going on. I fully agree with Dr. Reeve (Ohio) that chloroform renders us especially good service at two stages of labor, namely, when the cervix is almost dilated and when the presenting part begins to pass through the vulva. It is true that Zweifel has proved that chloroform inhaled by the mother is transmitted to the blood of the child and can be distilled from it as chloroform gas, but the quantity is so small that one need have no fear of its harmful influence upon the child. Furthermore, large quantities of chloroform may be administered to the child very shortly after its birth—in hare-lip operations, for instance—with comparative impunity. Hofmeier, however, ascribes the icterus, which appears in such children more often and more intensely than in others, to the influence of the anæsthetic. König's apparatus for its inhalation is much better than the handkerchief. Billroth, moreover, reports that a mixture of alcohol (30), chloroform (100), and ether (30) may be used to advantage (A. C. E. Mixture). Ethyl bromide has no advantage over chloroform, but owing to its irritating properties and disagreeable odor many disadvantages: interference with the pains, uncertainty of action, subsequent bronchitis ; and while Lebert, Montgomery and Haeckermann recommended it, Wood was convinced that it was more dangerous and would probably not be generally used, which observation was subsequently confirmed. On the other hand the mixture of oxygen and nitrous oxide ($O = 20$, $N_2O = 80$) recommended by Paul Bert and first tried by Klikowitsch (St. Petersburg), is very much to be recommended. I experimented with it in my clinic at Dresden, in 1881, in 50 cases, after which Döderlein, in Zweifel's clinic, in Erlangen, gave it a trial. His results agreed pretty much with mine. Narcosis by means of laughing gas is not dangerous and may be discontinued at the will of the parturient woman; it mitigates the pain in proportion to the intelligence of the person, as stupid persons often withstand its influence for a long time before its favorable effect is felt. In most persons its inhalation produces a state of intoxication for a short time, with a very frequent tendency to laughter. Women to whom it is not administered until the stage of expulsion, can seldom be induced to inhale it quietly, while when it is administered in the first stage of labor its beneficial action is at once felt and extends to the second stage. It is especially useful in primiparæ.

The pulse of the parturient woman is usually slowed considerably by laughing gas, but finally reaches its original rate again. The child's pulse is also slower in 8 per cent., but usually it seems to be more frequent. The woman's temperature rises often several tenths of a degree. At first the pupils are somewhat contracted. The pains are not the same in strength or duration, but are often more frequent and stronger, and existing vomiting frequently ceases. Klikowitsch and I have both observed *aphasia*, and once in 50 cases a hystero-epileptic attack was caused, and in one other case a real epileptic seizure followed its use, but otherwise no bad effects were observed, either as regards the mother or the child. The oxygen of the blood remains in its normal combination, while the nitrous oxide probably circulates in much looser chemical combination in the blood, absorbed by the plasma (*Döderlein*). These researches should be supplemented by the observations of others, and were by no means thought conclusive by us, as Döderlein believes. It seems to me most practical to get the mixture from the apothecary, as was formerly the case, and that he should be provided with rubber bags, which he may fill and furnish to the physician when needed. In this manner the gas might be introduced into private practice and would not be monopolized by the clinics. A number of interesting questions attach to its use, but we refrain from discussing them. The apparatus, consisting of a rubber bag like a pillow, is inconvenient, it must be confessed, but this is entirely subordinate; in abnormally painful labor its is, at any rate, an extremely important remedy.

In addition to general anæsthesia, there are several methods of producing local mitigation of suffering, even in normal pains, especially in weak individuals. Among these are friction with extr. meconii, 2.5; lanolin, 50.0; ol. olivarum, 10.0; chloroform liniment (25.0 chloroform, 75. ol. hyoscyami) or a mixture of 1 part of chloroform to 2 parts of ether, which is to be rubbed in over the region of the sacrum; and finally hydrate of chloral, 1 gram to 50 grams of water, per rectum, or the same dose in solution with syrup aurant. cort., a teaspoonful three or four times daily. In January, 1885, Doléris first tried painting the cervix and vulvar region with a four per cent. solution of *cocaine*, and out of nine cases he relieved the pain very considerably in six. In my clinic, Dr. Juhl tried this remedy in 13 cases, and obtained very good results, especially before the rupture of the bag of waters, by carefully drying the external genitals that the anæsthetic might act undiluted upon the mucous membrane. When the genitals were very moist, owing to the amniotic fluid, there was less action, but at the time of the passage of the head through the external genitals, the remedy again proved very serviceable. It must, however, be painted on frequently enough, at least every five minutes. Finally it may be mentioned that Keener recommends the *induced current* as a means for alleviating the pain; it also strengthens the force of the contractions.

CHAPTER XIV.

The Treatment of the Third Stage of Labor.

LITERATURE.

Ahlfeld: "Berichte u. Arbeiten aus Giessen," 1883, pp. 83–117. Dohrn: *Deutsche med. Wochenschrift*, 1883, Nr. 39. Dyrenfurth: *Archiv für Gynäk.*, XXII, 334. Ribemont-Dessaignes: "De la délivrance par tractions et par expression," Paris, Doin, 1883. Lumpe: *Archiv f. Gynäk.*, XXIII, Heft 2. Stadtfeldt: *Centralbl. f. Gynäk.*, 1884, VIII, 580. Winter: *Allgemeine Deutsche Hebammenzeitung*, 1886. Freund, A. W. und Kabierske: *Centralbl. f. Gynäk.*, 1881, V, 145. Credé: *Monatsschr. f. Geburtsk.*, XVII, 274. Winckel: *Monatsschrift f. Geburtskunde*, XXI, 265. Prochownik: *Centralbl. f. Gynäk.*, 1885, IX, 433. v. Campe: *Zeitschrift f. Geburtsh. und Gynäk.*, X, 2 Heft.

A few words with reference to the treatment of the bag of waters are appropriate here, owing to the recent tendency to meddlesome interference during labor. There are authors who teach that the membranes may be ruptured and the water allowed to flow off as soon as the second stage is begun, *i. e.*, the cervix fully dilated (*Winter*). My friends, Lusk and Parvin, also hold this to be advisable if rupture does not occur spontaneously at that time. I am of opinion, on the contrary, that as long as the membranes advance without hemorrhage, one has no right to rob both the mother and the child of the advantages offered by the integrity of the membranes—advantages which consist of the most gentle dilatation, the protection of the bones of the child's head from dislocation and the mother's parts from direct friction.

The artificial rupture of the membranes, although apparently unimportant, should not be underestimated, and my opinion is that it should not be done unless the advancement of the head is hindered or the placenta becomes detached, or some other danger threatens mother or child. Unless this is the case, rupture should be postponed until the bag protrudes at the vulva.

It is natural that, after the child is born, the patient and her friends hope and trust that all may soon be happily ended and that she may get some rest, in a word, that the afterbirth may be delivered as soon as possible. The physician also longs to get home, and as he cannot leave the half-delivered woman before the birth of the placenta, this process is accelerated. This was the case in ancient times and remains so to this day. One persuades one's self that the placenta is already detached and lies like a foreign body in the uterus and should be removed as soon as possible. Nature should be our teacher here, and we should make it our duty not to interfere unless circumstances of some kind render it inexpedient to wait any longer. A force which has sufficed to bring forth a child to the light of day, in spite of the resistance offered by the pelvis, the soft parts and the child itself, will be capable of ejecting the less resisting placenta without the help of our hands. W. A. Freund and Kabierske have done great service recently in bringing out this point, and Ahlfeld, Dohrn and others have shown the disadvantages of the too rapid delivery of the placenta.

In glancing briefly over the different methods of treatment of the third stage of labor in vogue in our century, we may divide them into passive and active, and subdivide the latter into indirectly active methods, such as coughing, sneezing, bearing down, and straining; those directly active upon the uterus, and finally those directly active upon the placenta. All these methods are in use at the present time by civilized as well as savage races. The purely passive method was largely employed at the beginning of the nineteenth century, but was supplanted by manual extraction, to be described later, and it was only in England and Ireland, as early as the middle of the present century, that the placenta was delivered by means of external pressure, which procedure was introduced by Credé, in 1861, into German lying-in institutions. About seven years ago, the passive method, which allowed greater scope to the natural forces, was again advocated and adopted. This statement, however, applies only to clinics, for in private practice most obstetricians deliver the placenta by active measures from a quarter to a half hour after the birth of the child. All these methods were also employed by the most ancient races, and are still by the savages of our present time. It has usually been asserted that, from tne most ancient times up to the beginning of the sixteenth century, there was no treatment of the third stage (*Eucharius Rösslin*, 1513), and I therefore think myself justified in giving these details. In fact we have not advanced much beyond the ancients, for the people of India, for instance, delivered the delayed placenta by external pressure, the patient being shaken violently by some strong person. The same end was attained by tickling the fauces in order to cause vomiting (*Haeser*, I, 34). The Chinese advised in such cases that no medicine be given, and that the puerperal woman be not frightened, " for many die because they listen to the midwives and allow them to lay hands upon them" (*Rehmann*: "Miscellanea," 2641). Among the Greeks, Euryphon Knidios advised diuretics and shaking; Hippocrates, sternutatories, and when delivery of the placenta was delayed, wine and viands cooked or fried in oil. "Ad secundinas deturbandas sternutatorio immisso os et nares comprimit." Pepper, castoreum, etc., were given to cause sneezing. Aristotle believed that the uterus inverted itself during expulsion of the child, and that the afterbirth followed in the same way. Vaginal extraction was known to the Romans, for Celsus describes it so clearly and distinctly that I append his own words. Liber VII, Cap. XXIX, p. 492: "Medicus deinde sinistra manu leniter trahere umbilicum debet ita, ne abrumpat, dextraque eum sequi usque ad eas, quas Secundus vocant, quod velamentum infantis intus fuit: hisque ultimis apprehensis, venulas, membranulasque omnes eadem ratione diducere a vulva, totumque illud extrahere et si quid intus præterea concreti sanguinis remanet. Tum compressis in unum feminibus illa in conclavi collocanda est, modicum calorem sine ullo perflatu habente. Super imum ventrem ejus imponenda lana succida in aceto et rosa tincta. Reliqua curatio talis esse debet, qualis in inflammationibus et in his vulneribus, quæ in nervosis locis sunt adhibetur."

Furthermore, in the *Gynæciorum* (Basle, 1566) on page 59 to the question: Quæ sunt quæ propter retentionem secundinarum antique adhibebant? ex libro Moschioni (117–138 after Christ), the following answer is given: "Sternutamenta et à scala suspensiones et potiones dabant, quæ eas ejicere possent et fumos suffiebant et pessos sanguinem educentes subjiciebant. Quin etiam pondera ad ipsum folliculum (?) ligabant." The following quotation will show, however, how cautiously Moschion himself conducted the third stage of labor: "Cum infans in manus obstetricis cecideret si ad umbilicum adhuc cohæret obstetrix debebit etiam attentare leviter hac et illac adducens; an per ipsum umbilicum infantis possit foras adduci, adjuvante conatibus suis et ipsa parturiente, idque fiat quando fundo non adhærent et orificium patet. Neque vero in directum conetur ut ne matrix simul adducatur. Si vero tarditas ipsa moram habuerit, præciso umbilico separandus est infans eumque alia mulier accipiat et reliquum ipsa teneat, et cum se matrix aperiat ducendum cum autem recludit non conandum. Sed si ruptum vel præcisum statum intus se absconderit, orificio matricis patente per unctam manum statim obstetrix immittere debebit et si jam ad fundum matricis recesserint et si obvolutæ sunt et natant, quacunque parte apprehensis tollere debet. Si vero adhuc ad fundum matricis teneantur, resolutis ibi digitis et apprehensis secundinis, tentare hac et illac et adducens persuadeat auferre. Illæ vero quæ imperitia in directum conantur, frequenter et ipsam matricem adducunt. Sed si ne sic subsecutæ sunt aut orificium matricis statim se clauserit ut neque manus immitti neque ipsæ exire possint et fervor fuerit subsecutus, ibi eisdem dimissis omnibus succis et encathismate et cataplasmatibus et vaporationibus, quibus ad fervorem uti solemus, utendum est. Hac enim diligentia omni strictura laxata frequentius quidquid ibi remanserit et alienum est foras emittitur et sua sponte cadit."

These quotations suffice to prove that the Greeks and Romans practiced an active treatment of the stage of the afterbirth. Let us now see how the uncivilized races of the present day remove the placenta.

The Japanese remove it by traction from the vagina, and the Melanese bind it to the mother's great toe. Others express it from the abdomen, for instance, the Burmese in the dorsal position, the Makas sitting, the Sioux standing, and many of the Indian tribes kneeling. The Comanches and Papagoes remove it by kneading and traction on the cord. On the other hand, the following leave it to nature, viz.: The Brazilian Indians, the Guianas, the Antis and Campas, the Apaches, the Polynesians, the Negroes of old Calabar and Surinam, the Tartars and Russians in Astrachan. The Australians usually force it out in the squatting position, just as in defecation (*Engelmann, l. c.*).

The usual methods of the present day are as follows:—

(1) Extraction of the placenta from the vagina by winding the cord around the thumb and forefinger of one hand, fixing it with the thumb, while the index and middle fingers of the other hand are passed along the cord until it reaches its insertion at the placenta, and when this is reached, traction is made in the direction of the hollow of the sacrum and the placenta gently brought down. As soon as its large circumference has entered the external genitals, the placenta is grasped with both hands and revolved upon its axis so that the membranes may be twisted off. By this method, tearing of the cord, retention of parts of the membranes and placenta, and even inversion of the uterus are possible. For this reason it is not so advantageous as,

(2) *Removal of the afterbirth by pressure upon the fundus.* As soon as

the uterus is felt to be sufficiently contracted to lead to the supposition that the placenta is detached, *i. e.*, ¼ to ½ hour after birth, powerful pressure is applied to the fundus during a pain, just as one squeezes out a sponge, and as though one would press it against the middle of the sacrum. This pressure is relaxed as soon as the pain disappears and is again applied upon its reappearance. The placenta is by this means pressed out through the uterus into the vagina and external genitals, and not until the greater part of it has passed through the latter is it grasped by the hands and the membranes twisted off in order to avoid tearing them. According to my experience, the placenta may be easily removed by this method in from five to seven minutes after delivery of the child. In multiparæ it usually takes somewhat longer. This method of Credé has been somewhat modified recently by Prochownick. According to this author, the uterus should be controlled immediately after delivery by the hand laid flat upon it, then after several minutes of perfect rest, light rubbing of the fundus is begun, in order to produce energetic contractions. As soon as the physician recognizes the onset of the third contraction, the woman is directed to brace her feet against the foot of the bed and bear down with all her strength, at the same time slightly flexing the thighs. If the expulsion does not follow with the third pain, the fourth pain is passed over and the same procedure as above described repeated with the fifth pain, the sixth passed over, and repeated again with the seventh. This period of seven pains corresponds to about 30 or 35 minutes, which time having elapsed, the case in question, as regards the expulsion of the placenta, becomes pathological in the minds of all those who do not favor the expectant treatment, as Prochownick unjustly thinks. According to our before-mentioned experience, this method is also decidedly too active. Engel completes the delivery by Credé's method, only very slightly modified, in 15 to 30 minutes; in 652 cases, he found a duration of ¾ of an hour in but two, in five only did considerable hemorrhage occur, and finally, in three excessive after-pains were complained of. Von Campe also thinks, basing his opinion upon 120 cases, in 24 of which the placentæ were still unborn twelve hours after birth, and were not delivered until 50¼ hours had elapsed, that, from the practical as well as the scientific standpoint, Credé's method should be recommended and carried out 20 minutes after the child's birth. He has, however, judged the natural expulsion too unfavorably because this did not take place upon an average until eight hours afterward. K. Schroeder maintained that one should not wait too long, because the puerperal woman soon becomes uneasy. In his last work he taught that the detachment and expulsion of the afterbirth may be left to nature until it has passed below the ring of contraction. As soon as it is noticed that the uterus is becoming harder and smaller, and then relaxes again somewhat, with bulging of the portion lying below the ring of contraction, thus indicating that the placenta is completely detached and has entered the lower uterine segment, it may be easily and harmlessly removed, when slight pressure with the flat hand is made upon the region of the ring of contraction, *i. e.*, below the contracted fundus. As a rule, however, a strong bearing-down effort is sufficient to expel the placenta. Moreover, traction upon the cord in such cases is certainly quite harmless. If the upper border of the placenta is still adherent to the body of the uterus, so that only a portion of it is below the ring of contraction, then Credé's method had better be employed. In contradistinction to these authors, we teach and practice the following method in our clinic.

As soon as the child is born, it is ascertained by palpation whether the fundus is well contracted and what its position is; then a bed-pan is pushed under the half-delivered woman, in order to catch every drop of blood that passes from her. The woman is now advised to bear down as soon as she feels the approach of a pain until the placenta passes out into the vessel under her. We press neither upon the fundus nor upon the lower uterine segment with the hand, and it seems to us, that simple expression by means of bearing down is much better than compressions of the lower uterine segment. Only when the hemorrhage is greater than usual, or the influence of the abdominal muscles does not suffice, or when the average duration of the third stage, two hours, is exceeded, though there be no hemorrhage, do we believe that active measures are indicated; then Credé's method is undoubtedly the sole procedure indicated, for at this time the placenta is still partly above the ring of contraction. In case this does not succeed, manual extraction of the placenta is employed; this will be referred to later on. In private practice, especially when the physician lives a long distance away from the puerperal woman, I recommend K. Schröder's method (simply a modification of Credé's, but it should not be begun until one-half or three-quarters of an hour after birth; for it seems to me that it is better to wait until the placenta is detached before applying pressure to the fundus, as pressure at this point rather pushes the placenta back against the posterior abdominal and pelvic walls, and also tends to displace the uterus. As soon as the placenta is born, it should be laid upon a plate and examined in order to see if it is complete, noting its smoothness and gradual flattening toward the membranes, the relation of the cotyledons to one another, and finally the location and size of the tear in the membranes, and the condition of the ovisac. If the placenta is complete, the external genitals of the patient are washed with corrosive sublimate solution and dried, and then the condition of the external genitals should be examined in the lateral position, in order to discover any important injuries to these parts, if present.

CHAPTER XV.

The Management of Twin Labors.

The treatment of twin labors until the delivery of the first child does not differ from simple labors. The diagnosis should be communicated to the parturient woman as gently as possible, and if the presentation of the second child be normal, the physician should simply wait until the pains re-commence and the second bag of waters appears. No attempt should be made to remove the placenta of the first child, for the placenta is often common to both children, so that the second child would suffocate if it were removed. The extent of the hemorrhage, and the heart sounds of the second child must be carefully watched, because if the strength and frequency of the latter are lessened, artificial aid will be necessary. It is quite important to avoid post-partum hemorrhage by means of the injection of ergotin (0.05 gm. hypodermically, repeated two or three times). The treatment of the third stage is the same as in simple labors. Finally, the nurse should be told positively that she must stay at least three hours with the puerperal woman, and frequently feel the fundus, in order to be sure that contraction of the uterus is maintained. After delivery a moderately tight abdominal bandage should be applied and a thick layer of salicylated cotton applied to the vulva.

CHAPTER XVI.

The Care of the Child Immediately after Delivery.

Having placed the mother in a comfortable position, seen that she is dried and covered up well, the physician should carefully examine the child with reference to the caput succedaneum, the condition of the eyes, ears, nose, mouth, the genitals and the anus. The bones of the head should be felt in order to establish the presence of injuries or malformations, and the ligation of the umbilical cord once more noted. If there has been a purulent discharge from the mother, the child's eyes should be carefully washed out with pure water squeezed out of absorbent cotton, and a few drops of a 2-per-cent. solution of nitrate of silver should be dropped upon the cornea by means of a glass rod. This method (Credé's) has been found to be the best prophylactic against ophthalmo-blennorrhœa in children. Finally, the child should be bathed in warm water (95° F.) and sweet oil (not soap), and the vernix caseosa, blood, meconium, liquor amnii, etc., washed off. The temperature of this first bath is by no means an unimportant point, for the conditions to which the child is exposed immediately after birth have a decidedly cooling effect. In 101 cases in my Dresden Clinic, Sommer found an average reduction after the first bath of 3.27° F. Strange to say, this average reduction was only 2.5° F. in boys, but 4.03° F. in girls. Upon an average, the influence of the first bath may be rated at 0.99° F. The temperature of the surrounding medium accounts, for the most part, for the remaining loss of heat. Andral attributes the low temperature solely to lack of circulation, owing to the still imperfectly developed vascular system. The child's body not only offers a comparatively large surface for evaporation, but its skin is also very rich in blood, hence the loss of heat is great. Therefore, the new-born infant should be immediately wrapped in something which is a bad conductor of heat, enveloped in the same after the bath, and carefully dried off in it. The cord should be carefully examined again, dressed with salicylated cotton, and the abdomen in the region of the umbilicus wrapped around pretty tightly with a bandage about three fingers in breadth. A cotten shirt, open behind, should then be put on, the genitals and lower extremities are enveloped in a triangularly folded napkin, whose base corresponds to the sacrum; a warm jacket is put on to cover the thorax and upper extremities, and a thick piece of mackintosh, about 13¼ metres long and 30 cm. wide, is wrapped loosely around the child and fixed by a bandage in the umbilical region; and finally, the head is covered by a little hood of wool. The English do not wrap up the child's body, but dress it in long clothes which are open at the lower end. As soon as it is dressed, it is laid in the cradle, which is maintained at a certain heat by means of hot bottles, except in summer. The cradle is then placed where it will not be exposed to bright light, draughts of air or loud noises.

PART III.

THE PHYSIOLOGY AND MANAGEMENT OF THE PUERPERAL STATE.

LITERATURE.

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Definition.—By the puerperal state is meant that period after the confinement of the woman during which her genital organs are returning to their former condition. This process begins immediately after birth, and is not completed until all traces of pregnancy and labor, with the exception of cicatrices, have disappeared from the uterus, and the placental site is no longer recognizable. The duration of this period is usually from four to six weeks.

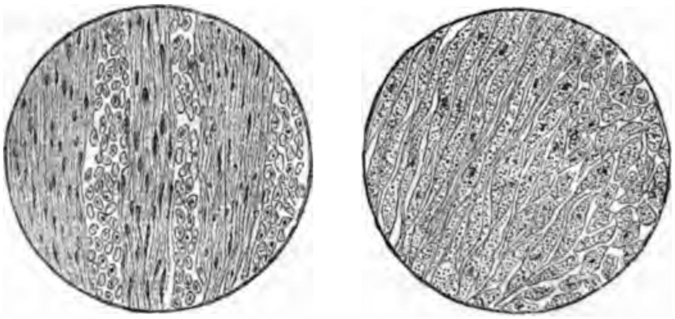
CHAPTER I.

Anatomical Changes in the Genital Organs.

Directly after the expulsion of the ovum the empty uterus weighs 750 to 1000 grams, is 16 to 18 cm. long; its average length measured by the sound is 15 cm. from the anterior lip of the external os to the fundus of the uterus (*E. Börner*). Its wall is from 2 to 4 cm. thick at the fundus. A week afterward it is scarcely half as heavy, and two weeks later weighs only about 350 grams, 200 gm. five weeks later, and at the end of the second month only about 5 to 75 grams. Hence, in five or six weeks it has returned to about its original size. This decrease, as determined by measurements, commences usually as early as the first twelve hours; in rarer cases not until thirty-six hours have elapsed; the length is lessened more rapidly than the width, the maximum daily decrease in length being 2.6 cm., in width 2 cm.

The most marked decrease in size as well as in weight occurs from the ninth to the twelfth days (*Börner*). This great transformation of the organ takes place so rapidly that in normal involution the fundus uteri lies behind the symphysis on the ninth day of the puerperium, *i. e.*, the entire uterus has returned to the true pelvis and is found there in a state of anteversion or anteflexion. The gaping os externum has closed up again and the portio vaginalis begins to reappear. The decrease in the dimensions of the uterus is effected essentially by a symmetrically advancing fatty degeneration, which attacks the muscular fibres upon all sides alike, and makes its appearance soon after birth in the shape of minute globules which surround the nuclei of the muscular fibres. These increase in number, but finally disappear by degrees, and with their disappearance each muscular fibre becomes smaller. The following wood-cuts show the contrast between the gravid (Fig. 41) and the puerperal (Fig. 42) uterus, as regards the condition of the muscle fibres. It may be remarked that Fig. 41 was derived from a woman who died of œdema of the glottis due to struma, before her confinement, and Fig. 42 from a puerperal woman who succumbed to pneumonia the sixth day after labor. The vessels and nerves atrophy in the same manner as do the muscular fibres. In the large vessels the fatty degeneration is promoted by connective-tissue proliferation in the tunica intima and fatty degeneration of the media, thus narrowing or closing them completely. According to Fischel, the decrease in size of the uterus during the first days of the puerperal state may perhaps be due to a change of the muscle-albumin into a soluble modification, into peptone, which would then be found in the urine; for accord-

FIG. 41. FIG. 42.



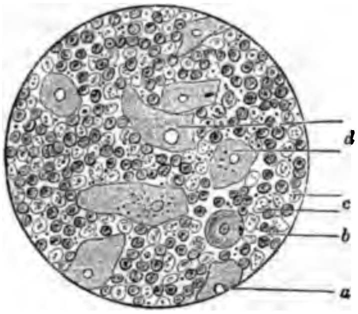
Muscle fibres of the gravid and the puerperal uterus.

ing to Hofmeister, the greater part of the peptone, which does not reach the blood from the intestinal canal, is excreted by the kidneys. Fischel, in fact, found peptonuria to be a constant condition of the normal puerperal state, and furthermore he found peptone quite as frequently in the lochial discharge, in the myometrium and in the placenta, at times even in the urine of gravid women. The number of observations, however, is too small to enable us to conclude positively that the appearance of peptone in the urine of puerperal women is due to its absorption from the uterus, although this is probably the case. The placental site, which is about the size of the palm of the hand immediately after birth, is about 3 to 4 cm. wide two weeks afterward and still somewhat uneven, due to the projection of the thrombi from its surface. Not all of the divided vessels are closed by thrombi, but some of them are directly compressed and closed by the thin layers of muscular fibres lying between them. Four to six weeks after labor the placental site may still be recognized, but is smooth and barely 2 cm. wide, and the places formerly occupied by the vessels are now marked by yellow and black spots of pigmentation. While the uterus is growing smaller in this manner, a new formation of unstriped muscle-fibres has been going on from the very beginning, and these fibres are first round cells which gradually become elongated. Shreds of the decidua vera that have remained in the uterus are expelled with the lochial discharge and the formation of the new decidua, which had already commenced during pregnancy, now goes on with increased rapidity. With the discharge of the shreds of the decidua, there is an increased development of interglandular tissue, and new epithelium is furnished by the glands to take the place of the epithelium that has been lost. During the course of this process there is a considerable exudation and marked emigration of white blood-corpuscles. These, together with the secretion of the cervical canal and raw places upon the neck and lips of the uterus, constitute the puerperal discharge. The uterus does not entirely return to its original size and shape during involution. On the contrary, it remains, as a rule, somewhat longer and more bulging than before pregnancy; and furthermore, as a consequence of extreme dilatation of the cervix, scars upon the external os give it a kind of puckered appearance.

The most important causes of the involution of the uterus are its contractions, which considerably lessen the blood supply, and exercise great pressure upon the vessels, nerves and muscle fibres. These contractions after birth are of an active nature, and are not to be regarded as merely due to retraction, in consequence of the elasticity of the fibres; they are under the influence of the central nervous system, as is shown by the fact that any great excitement may cause them to decrease, and perhaps thus lead to post-partum hemorrhage. The elasticity and muscle-tonus aid the organ to render itself more compact during the intervals between these pains, when it does not entirely return to its original volume, but persists in holding what it has gained by contraction. The organs in the neighborhood of the uterus, the tubes, ovaries, broad ligaments and vagina, are still very hyperæmic after birth, and in the vagina, especially near the vulva, are seen irregular tears and fissures, which easily bleed. These gradually become smaller, are covered over by the emigrated epithelial cells, and finally their place is taken by white cicatrices. The infiltration of the neighboring organs is less marked. The vagina becomes narrower, and the folds upon its surface are more marked, but are not so prominent as before labor. The external genitals are wrinkled, and the rima vulvæ is either entirely closed or else gapes slightly at the posterior commissure.

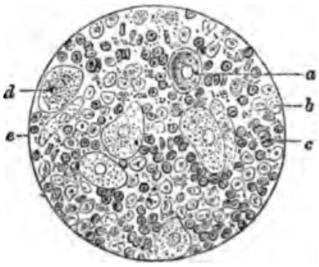
The discharge which flows away from the genitals is called the lochia, and is at first red or brownish-red (lochia cruenta), and, for the most part, consists of fluid blood, small blood clots, and shreds of the decidua vera (Fig. 43).

FIG. 43.



Lochial discharge of the second day. A few isolated cocci and streptococci. Lochia cruenta. *d*, epithelia; *c*, white blood-corpuscles; *b*, red blood-corpuscles; *a*, decidual cells.

FIG. 44.



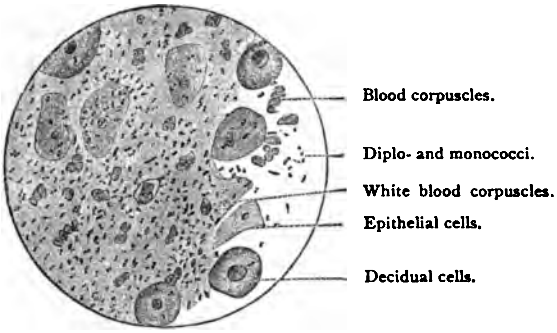
Lochial discharge on the fourth day. *a*, cells of the decidua; *b*, white blood-corpuscles; *c*, a few red blood-corpuscles; *d*, epithelial cells without nuclei from the vernix caseosa, with nuclei from the parturient canal; *e*, numerous clusters of cocci, partly in cells without nuclei, which are stained blue by Gram's method. × 330.

The second or third day this discharge becomes sero-sanguineous, poorer in red blood-corpuscles, richer in mucous cells and thinner in consistence; it is then called lochia serosa. This, in its turn, from the seventh to the eighth day becomes still paler or almost glairy in appearance, thicker, or creamy (lochia alba). It is now principally made up of mucus, pus-cells and epithelia. The pus-cells are derived from the small fissures which usually are still present in the external os, vagina and vulva, forming small ulcers at these points. Gradually, fat globules, crystals of cholesterin and young connective-tissue cells make their appearance. Furthermore, from the third day on, numerous and various forms of micro-organisms are present, viz., staphylococci (Fig. 44), monococci and diplococci (Fig. 45), streptococci and bacilli (Fig. 45). These are present in the lochial discharge of puerperal women who have no fever whatever. The duration of the discharge varies greatly. It is much less in the nursing than in the non-nursing woman, its quantity in the former weighing 0.745 kgm., while in the latter it amounts to 1.31 kgm. Its average duration is from two to three weeks. About the third day, when the congestion of the breasts is greatest, the discharge is not quite so copious, and in the presence of marked increase of secretion from other organs, such as diarrhœa or profuse sweats, its quantity is likewise lessened. *The condition of the blood* of the puerpera has been studied by Kosin and Eckert. They found that the number of white blood-corpuscles decreases again after a normal labor, while that of the red globules remains the same, although in the first days after labor the quantity of hæmoglobin is less. Toward the end of the first week both kinds of blood-corpuscles again increase in number. Furthermore, numerous shining elements are constantly found, and a great number of small red blood-corpuscles.

The puerperal changes in the breasts go hand in hand with the involution of the uterus. On the second or third day the breasts become more congested, fuller, swelled, and project from the thoracic walls as hard hemispheres, and a thin fluid begins to ooze forth. This fluid is derived from the blood; the ingredients mixed with it are the secretion and epithelial cells of the acini.

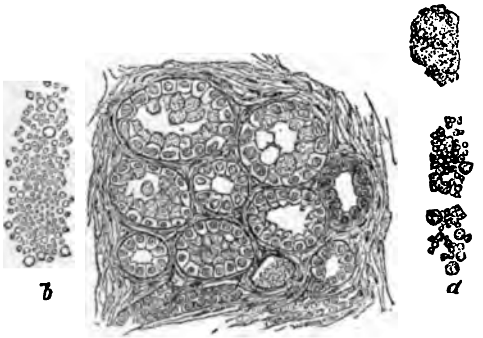
The milk of the first days of the puerperal state is called *colostrum*, and is composed of milk serum and granular globules. It is translucent, shows yellow droplets here and there, and contains albumin principally, with numerous solid ingredients, especially salts in greater quantity than the milk of a later period. Furthermore, colostrum corpuscles are present, which are simply epithelial cells which show movement and contain fat globules. The colostrum has a cathartic action, owing to the calcium phosphate, magnesia, sodium and potassium chloride contained within it, and leads to the evacuation of the meconium. The albuminoid interstitial substance of the colostrum corpuscle, which glues the granular globules together, swells up, and the colostrum corpuscles finally decompose and become milk globules which are held in suspension in the fluid by the viscid interstitial substance which has just been set free. The albumin is changed into casein, from which it is distinguished by boiling and by precipitation with rennet.

FIG. 45.



Lochia, seventh day. No elevation of temperature.

FIG. 46.



Mamma in lactation, × 330; *a*, colostrum; *b*, milk.

The numerous milk globules are said to consist of a haptogen membrane containing fat, but in reality are nothing but fat globules, emulsified by the soluble casein, and which are derived from the epithelia of the gland, by the detachment of that part of the gland cell which projects into the lumen of the acinus (see Fig. 46); the albumin dissolves, fat globules are set free, but without dissolution of the gland cells (*Heidenhain*). The colostrum corpuscles disappear in the nursing woman in from three to five days. Milk rich in milk globules is whitish, very nourishing, and contains 88.9 per cent. water and 11.1 per cent. solids:—

3.92 per cent. Casein (2.430).	4.36 per cent. Milk Sugar.
2.66 " Fat.	0.14 " Inorganic Salts.

Furthermore, according to Schmidt, of Mülheim, it contains: Albumin, 0.38 per cent.; peptone, 0.13–0.33 per cent.; urea, 0.0079 per cent.; lecithin, 0.0038; cholesterin and probably hypoxanthin.

The quantity of milk secreted by healthy breasts is equal to the amount the healthy child should obtain by nursing, and according to Gassner is equal to 2.15 kgms. in the first eight days. According to our own observations, in Dresden, its quantity is as follows:—

Day.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
	—	96	192	234	363	441	501	518	621	648	705
According to Hackner:	44	130	196	266	352	385	393	411	425	—	—

CHAPTER II.

The Phenomena Observed in the Healthy Puerpera.

LITERATURE.

Winckel: "Temperaturstudien bei der Geburt und im Wochenbette." *Monatsschr. f. Geburtskunde*, XXII and XXIII. Vejas: Volkmann's "Sammlung klin. Vorträge." Nr. 269. Carl: "Ueber den Puls der Wöchnerinnen." I.-D. München, 1887. Meyburg: *Archiv f. Gynäk.*, XII, 114. Fritsch: *Archiv f. Gynäk.*, VIII, 383. Blot: *Arch. gén. de méd.*, Mai, 1864. Löhlein: *Zeitschrift f. Geburtsh. und Frauenkrankheiten*, I, 491. Dumas: *Archives de tocol.*, July, 1878, p. 410. Olshausen: *Centralbl. f. Gynäk.*, 1881, Nr. 3. Winckel: "Studien über den Stoffwechsel." Rostock, 1865, p. 64–83. Kleinwächter: *Archiv f. Gynäk.*, IX, p. 370. Klemmer: In Winckel's "Berichte u. Studien." Bd. II, 161. Blot: *Comptes rendus.* Tome, 43, p. 676. Hempel: *Archiv f. Gynäk.*, VIII, 312. Hofmeister: *Zeitschrift f. phys. Chemie*, I, 101. *Centralbl. f. Gynäk.*, 1878, p. 88. Johannovsky: *Archiv f. Gynäk.*, Bd. XII, 448. Grammatikati: *Centralbl. f. Gynäk.*, 1884, Nr. 23. Sahli: *Deutsche med. Zeitung* v. Grosser. 1885. Baumm: l.c., München, I.-D.

Passing now to the consideration of the general condition of the recently-delivered woman, and beginning with the pulse, respiration and temperature, we find that there is a rise in temperature of about 0.5° C. during the first twelve hours after birth, which is compensated for in the next twelve hours by the circulatory changes, the increase of pressure in the capillaries of the kidneys, liver, lungs and skin, and the renewed activity of these organs, so that in twenty-four hours after delivery the temperature is about the same as it was immediately after delivery. Then a second, likewise very moderate, rise occurs in connection with the establishment of the lacteal secretion, which falls again as soon as this process is active. The daily variation under normal circumstances is not more than 0.1° F., there may even be much less difference between the maximum and minimum. During the first two weeks of the puerperal state the variation is barely 2° F. The average temperature is about 0.4°–0.6° F. higher than during labor, and varies from 99.0° to 100.75° F. In spite, therefore, of the great involution and changes in all the organs, the temperature of the puerperal woman shows great constancy, and its determination is of the greatest importance in judging of the puerperal condition. If strict antiseptic treatment is carried out, 80 per cent. of all cases, in hospitals or private practice, should show this normal course and remain free from fever. If the puerpera is not subjected to harmful influences, she will have no fever. The normal establishment of the lacteal secretion is not accompanied by high temperature, and if it be present there is always some local cause. The idea that every puerperal woman must have fever is false, and was declared so to be by Carus as early as 1820. And now the obstetrician modernizes this old view and tries to smuggle in "traumatic fever" in its stead, thereby getting nearer to its origin, but by no means completely explaining it. The expression "milk fever" is obsolete and even dangerous. For more than twenty-five years I have combated it, in opposition to K. Schroeder and others. It has been maintained recently, that the stasis of the milk occurring during the first days is marked by greater distention, tension and sensitiveness of the breasts, swelling of the axillary glands, tearing pains radiating to the shoulders and arms, increased frequency of the pulse and rise of the temperature to 104.9° F. or more; that this condition is milk fever, and, furthermore, that the increase of the secretion of the milk and perspiration are followed by diminished temperature and less tension and irritation of the breasts. I, nevertheless, contend, in spite of all this, that all these symptoms may be pronounced in either multiparæ or primiparæ with entire absence of fever, and that where the temperature was over 101.3° I have always succeeded in finding, by careful examination, some other decided cause for its presence. The appearance of fever cannot, therefore, be explained in this way, and when chills and fever are observed in a puerperal woman, it is our duty to recognize the seat of the trouble and combat it directly. Whoever retreats behind the veil of milk fever harms the patient and aids to propagate false theories.

While the changes of temperature are comparatively slight, the pulse of the patient, even when half delivered, shows a marked variation. It is softer. The after-pains cause greater arterial tension and the series of pulse curves becomes higher, but the curves are smaller. As soon as the pain passes off the pulse becomes soft again and remains so until the placenta is expelled. Then it gradually becomes slower, according to our observations (*Vejas* and *Carl*), immediately after birth, or, at least, in a few hours, in opposition to Fritsch, who claims that this does not occur until twenty-four hours post-partum. It may sink to thirty-four beats per minute. In 60 per cent. of the puerperal women it amounts to sixty beats or less (38 per cent. from 60 to 51, 22 per cent. from 50 to 39 beats per minute); this slowing does not attain its minimum until the ninth day (*Meyberg*), and may last fourteen or more days (*Carl*). Beside this slowing, the pulse may be at times irregular. In rarer cases its former frequency persists, and it is very seldom that an increase of frequency is noticed, unless there is great loss of blood, and even then, although the quantity lost may be 1000 grams, the pulse may not be more rapid than normal. Both multiparæ and primiparæ are alike in this respect.

The following conditions have been regarded as causing this lessened pulse rate:—

1. Changes in the blood-pressure. (*Blot and Marey:* increased pressure; *Meyburg:* lessened pressure).
2. Absorption of fat from the uterus (*Olshausen*).
3. Disturbances of innervation (*Löhlein*).

4. Mental and bodily rest in the horizontal position, and the slow performance of all bodily functions (*Fritsch*). The pulse is slowed, however, under varying conditions, both with increase as well as decrease of pressure.

5. Schroeder's theory is that the heart has less work to do and does it with fewer beats.

This view is not consistent, for the pulse is very distinctly slowed after abortion.

Olshausen accepted the theory of absorption of fat from the uterus, because its direct introduction into the circulation by Rassmann caused a marked decrease of the pulse rate. In Rassman's experiments, however, the quantity of fat injected into the dog and rabbit was not only quite excessive, but this experiment cannot be directly applied to the puerperal state. The slow puerperal pulse occurs distinctly after abortions (Abortion in fourth month, pulse 40: *Vejas.*); hence injected fat acts otherwise than when it is slowly absorbed. Furthermore, the slowing may not occur until 3½ hours after birth, and there is no proportion between good and bad involution and the amount of decrease in the pulse rate. A slowing after a fall of temperature must not be confounded with normal conditions. Nervous influences as well as the causes proposed by Fritsch must be conceded, but the increased secretion of urine, demonstrated by the author and Klemmer, is against the acceptance of these as sole causes.

6. G. v. Liebig's experiments upon the slowing of the pulse led him to think that the cause demonstrated by him in the non-puerperal might also be operative in the puerperal state. v. Liebig constructed a very ingenious circulation apparatus in which suction could be applied above the centre of the circulation, just as it is applied to the heart and veins by the action of the lungs in the thoracic cavity. He found that with increase of this suction the soft tube representing the venous system was narrowed, and that in consequence of this the rapidity of the circulating fluid was lessened in proportion to the extent of the suction-force, and upon comparison of this fact with the conditions existing in the systemic circulation, he came to the conclusion that the frequency of the pulse is less in inspiration, because during this act the suction action of the lungs gains the ascendancy in the thoracic cavity (Sitzungsber. der Ges. für Morphol. u. Phys. in München, 1885). In view of these facts, it was reasonable to suppose that in puerperal women, whose vital capacity was increased, the slowing of the pulse would also be marked. Dr. Vegas, who undertook these investigations at my instigation, found that in 50 perfectly healthy puerperal women the vital capacity of the lungs was:—

1. The same as before birth in 26 cases, 18 primiparæ, 6 multiparæ.
2. Greater than " " " 17 " 4 " 13 "
3. Less " " " " 7 " 5 " 2 "

Of those whose *vital capacity* was the same after as before birth :—

Slowing of the pulse in 11 primiparæ and 6 multiparæ.
No " " " " 7 " " 2 "
" " " " 2 " " 11 " (with increased capacity).
No " " " " 2 " " 2 " " " "
" " " " 0 " " 0 " " lessened "
No " " " " 5 " " 2 " " " "

The greatest increase of vital capacity was 500 c.cm. in 42 pulses. Differences of 75 c.cm. were not considered. According to this, it is extremely probable that there is a causal connection between the slowing of the pulse and the increase of the vital capacity in puerperal women. These observations, however, show, as is often the case in regard to many other changes in the organism, that this cause is not the only one. They do not explain the lessened frequency of the pulse after abortion. Probably several causes are here combined. The vital capacity of the lungs varies in the last weeks of pregnancy, according to the condition of the abdominal walls, from 2700 to 3500 c.cm.; it is somewhat less in primiparæ, decreases also toward the end of the first stage and at the end of the second day of the puerperal state is somewhat lessened, evidently because of debility. The third or fourth day it begins to rise again and attains its maximum very shortly afterward. Further research is therefore necessary, especially with regard to the influence of the different puerperal secretions upon the lessened pulse rate after labor. The activity of the skin is likewise increased, usually at once, and copious puerperal sweats are noted, which cause a strong smell like butyric acid, and are most marked during sleep. They grow finally less, but may last for several days. The secretion is not distinguished from the ordinary perspiration by the presence of any specific ingredients; it causes a good deal of water to be given off, and is also accompanied by a rapid exfoliation of the epidermis, which helps to make the pigmentation or swelling of the skin disappear. It was formerly maintained that the puerperal urine is at first scanty and concentrated. I have proven that this is not the case; on the contrary, that it is increased in amount, and, furthermore, that this increase is simply due to a greater quantity of water; that the increase of urea is insignificant, while that of chloride of sodium is greater. Phosphoric acid is increased least of all, but sulphuric acid is somewhat greater in quantity. These statements, to be sure, were combated subsequently by Kleinwächter and Fritsch, but later experimentation conducted by Dr. Klemmer, in my Dresden clinic, demonstrated the correct ness of the earlier series of observations. The quantity of urine with a mea diet was 2.028 grams daily; specific gravity, 1.019; quantity of urea, 51. gm.; with egg diet, 2.029, 1.016 and 32.9 respectively; mixed diet, 148 1.021 and 26.1. Scanty secretion of the urine during the first days is lil wise abnormal, and demands a careful examination, which is of importance from a prophylactic point of view. Recent investigations have demonstrated the importance of the excretory function of the kidneys in another direction; for in the case of over-distention of the breasts, the ingredients of the milk pass into the blood, and milk sugar is found unchanged in the urine (*Blot*, *Hempel*, *Hofmeister*, *Johannovsky*). The normal puerperal urine contains small quantities of acetone (*Liebe's* iodoform test: the first products of the distillation of the urine are treated with iodide of potassium and caustic soda, whereupon the acetone causes a yellow precipitate of iodoform). According to Grammatikati (*C. f. Gynäk*, No. 23, 1884), the quantity of the milk secreted by the breasts is proportionate to the amount of nitrogen in the urine, for when the activity of the mammary glands is most marked (the second to the fourth day) the maximum quantity of nitrogen is reached. If the child is taken from the breast, the quantity of nitrogen becomes less on the following day.

The peptonuria already mentioned usually begins in the second half of the first day, often lasts beyond the fourth day, but seldom beyond the seventh. It may happen in primiparæ and multiparæ, in premature labor and pathological cases, but was lacking in a patient who had undergone Porro's operation. Peptonuria has no connection with the presence of peptone in the lochia (*Fischel*). Finally it may be mentioned that, according to Sahli, pepsin as such (as well as trypsin) was found in healthy urine before breakfast, having been absorbed from the stomach.

The activity of the intestine is at first slight; it must become accustomed to its new position and changed circulation; its movements are usually slower during the earlier days. It is quite easy to explain the constipation of the first three or four days in puerperal women. They eat very little solid food, drink a great deal of water, which is given off freely by the uterus, skin, breasts and kidneys; furthermore, their bowels have been cleared out by injections during labor, and everything remaining in the intestine has been pressed out by the child's head; more than this, the puerperal woman lies quietly in bed for the first few days. It may often happen that, owing to the fatigue of the abdominal muscles, the puerperal woman is not able to expel the fecal masses which have collected in the rectum. My researches upon the most appropriate diet for the puerperal state have established the fact that meat diet from the first day on leads to more frequent passages and that an enema is never necessary, but diarrhœa is of more frequent occurence, and undigested shreds of meat are found in the thin stools. When a mixed diet (meat and eggs) is employed, the intestine is emptied earlier, but the passages are within normal bounds, and the passages, if diarrhœal in character, are isolated and do not persist.

It is, of course, obvious that, in consequence of the increased elimination, the puerpera loses considerably in weight, and it was therefore not surprising that Gassner should have estimated this loss at 6.7 kgm.; in a puerpera weighing 56¼ kgm., 1.485 kgm. of the loss was represented by the lochial discharge (lochia cruenta 1 kgm., lochia serosa 260 gm., lochia alba 205 gm.). In non-nursing women he found the loss even to be 1250, 470 and 160 grams respectively. Kleinwächter, however, by means of better nourishment, arrived at a different result; he noted only about half the loss of weight reported by Gassner, viz.: 2812 gm., and Klemmer, in my Dresden clinic, by means of meat diet, succeeded in obtaining not only less falling off in weight, but in some cases the patients gained up to the tenth day. With a diet of eggs, the average loss in ten days was only 1026 gm., against only 900 gm. upon a mixed diet, or ⅙ of the loss reported by Gassner. Dr. Baumm, at my request, undertook a new series of experiments in Munich, after our puerperal patients had been put upon a better diet, in order to compare the results with those obtained by Gassner. The maximum loss of weight observed by Dr. Baumm ranged from 1700 to 6500 grams. Multiparæ and those who have nursed frequently lose more than primiparæ and non-nursing women; the greater the weight of the individual concerned, the greater the loss during the puerperal period. The loss is somewhat less from the first to the third day, but then the weight begins to increase again as follows, according to the order of the days (an average of 30 cases): 1.121, 0.247, 0.397, 0.476, 0.489, 0.529 = a total of 3.399 kgm., or 6.58 per cent. of the bodily weight, or 10.2 grams per kilogram. After twins, the loss is more marked; in Gassner's cases 105 gm. per kgm., and in one of my own cases 11 to 46 gm. per kgm., the whole loss amounting to 13.114 kgm. This woman, it is true, had pronounced œdema of the legs (circumference of the calf 44 cm.), and passed almost 14 litres of light-colored urine in 6 days. The factors influencing this loss of weight are those which have been mentioned above and need no further explanation. Accompanying these objective changes are certain *subjective phenomena of the recently-delivered woman*, which are as follows: Soon after birth a desire is felt for food and drink, and as soon as this is satisfied, a longing for sleep is manifested, and from this short sleep the woman usually awakens in a moderate perspiration, feeling fresher and stronger. A slight burning in the external genitals, arising from the presence of small wounds, is all that is complained of. After a time, a desire is felt to pass water, and this is usually accomplished, but is accompanied by slight pain, due to small tears in the neighborhood of the urethra. Not infrequently the first attempt to urinate is abortive, and it is only after several trials that the urine is finally forced out. In primiparæ, the occasional contractions of the uterus may be felt by palpation of the uterus, or they may not be felt at all, or only when the child is put to the breast. Multiparæ, on the contrary, suffer from quite severe "*after-pains*" for about two or three days, which, however, gradually become less and less; the shorter the labor, the more severely these after-pains are felt. The desire for food during the first days is not usually very great; thirst, however, is more marked, owing to the increased loss of fluid. Nevertheless, when the course of all the processes of involution is normal, solid nourishment becomes a necessity from about the third to the fifth day, and the English puerpera eats her beefsteak at this time with great relish. They seem to stand this very well, while our puerperal women, who are unaccustomed to meat, pass part of it undigested and suffer from slight diarrhœa. The increasing swelling and tension of the breasts renders movements of the arms and the lateral position difficult, they also sometimes cause headache; however, when the nipples are in proper condition, and the child takes the breast regularly and well, these slight annoyances usually completely disappear by the fifth or sixth day, great relief being afforded as soon as the patient has a free evacuation. Very often, when the child is nursed, there is some pain at the nipple; it is reddened and small vesicles are noticed, but this also quickly disappears, and as soon as the swelling of the breasts is reduced, the healthy puerpera begins to feel a sense of well-being, which increases as she sees her child thriving with each application to the breast. There is still a great tendency to constipation as compared with the non-puerperal condition, which continues as long as the patient remains in bed, and often longer. Moreover, she is subject to copious sweats. Even if the involution of the genitals has been normal, when the patient leaves her bed in most cases she is subject to a feeling of muscular weakness, for which every allowance should be made; this is usually overcome in a few days, and gives way to a better appetite and fresher appearance. In those who do not nurse their children, the duration of the red lochia is longer and the loss of weight greater, because the lochial discharge lasts longer; furthermore, a small quantity of blood may be passed after getting up. The involution of the uterus is much slower. Swelling of the breasts is also of somewhat longer duration, and the milk ceases to flow sooner or later, according to circumstances. Menstruation in those who do not nurse usually makes its appearance, upon an average, six to eight weeks after delivery. Women who have borne frequently usually have the easiest time of it during the puerperal period, and their subjective as well as objective condition is so good that they really have very little to complain of.

CHAPTER III.

The Diagnosis of the Puerperal Condition.

The symptoms which lead to the diagnosis of this condition, like those of pregnancy, may be divided into uncertain, probable and positive signs; for the same reasons as before mentioned, because the first-named may be present in the male, the second only upon the genitals of the female, and the third class, or absolutely sure signs, are derived from the ovum. In class I are included relaxed, withered, wrinkled, pigmented abdominal walls, œdema of the skin, varicose veins and sweats; to class II belong the swollen secreting breasts, with large veins, the nature of the secretion, colostrum; the gaping vulva with fissures of the perineum or within the vulva; the wide, smooth vagina, the remains of the obliterated hymen and the fissures in the vault of the vagina; the lengthened, fissured cervix, the gaping external and internal rings; the enlarged uterus, upon the internal surface of which the placental site may be felt for the first seven or eight days, and the lochial discharge. All these are only probable signs; none of them are sure when isolated, because they may be very pronounced in other conditions, as for instance, the secretion of the breasts may be present in tumors of the uterus and ovaries, and may also obtain without them, even at an advanced age; the changes at the vulva may occur in lupus, carcinoma, or may be due to the passage of foreign bodies, etc. All of these signs, or at least the majority of them, when taken together justify a positive diagnosis. The fact that they soon disappear, or rapidly change with time, is in favor of the diagnosis, as atrophy of the uterus, lessening of the quantity of its secretion, cessation of the secretion of milk. These may all be used as essential supports to the diagnosis.

Sure proof of the occurrence of birth is only furnished by the discovery of parts of the ovum. I remember the case of a servant who sued her mistress because the latter had accused her of having had intercourse with her husband. I succeeded in extracting a small piece of tissue about the size of a pea from the external os, and easily demonstrated the presence of very pretty chorionic villi, thus proving at once the occurrence of cohabitation, conception, abortion, and destruction of the child. If one succeeds in removing remains of the placenta from the inner surface of the uterus, the diagnosis is established beyond the question of a doubt. In most cases, the demonstration of shreds of the decidua with large nucleated and fatty cells, is of itself a sure proof. As regards the time that has elapsed since labor, the breasts, size of the uterus, the nature of its secretion, and the *freshness* of the wounds present will aid in determining the point in question. In a like manner the quantity and extent of the last-named conditions will determine the question as to whether the child was mature or born prematurely. On the other hand, it is not possible to establish the fact that twins have been born, in a woman who has been recently delivered. This question was put to me by one of our judges, and unless the placenta is still present, the possibility of such an occurrence must be admitted.

CHAPTER IV.

Changes in the Child after Birth.

LITERATURE.

Haake: *Monatsschrift f. Geburtsk.*, XIX, 339. Winckel: "Untersuchungen über die Gewichtsverhältnisse der Neugeborenen," XIX, 416. *Monatsschr. f. Geburtsk.* Kehrer: *Archiv f. Gynäk.*, I, 124. Krüger: *Archiv f. Gynäk.*, VII, 59. Ahlfeld: "Ernährung der Säuglinge." Leipzig, 1878. Gregory: *Archiv f. Gynäk.*, II, 48. Kezmarsky: *Archiv f. Gynäk.*, V, 547. Fleischmann: Wiener Klinik, Juni, Juli, 1877. Sommer: "Ueber die Körpertemperatur der Neugeborenen." I.-D. Berlin, Reimer, 1880. Dohrn: *Monatsschr. f. Geburtsk.*, XXIX, 105. Martin, A. und Ruge C.: *Zeitschrift f. Geburtsk. und Frauenkranheiten*, I, 273. Parrot-Robin: *Arch gén. de Méd.*, 1876, Bd. I, 129, 309. Cruse: *Jahrbuch f. Kinderheilk.*, 1877, Bd. XI, Heft 4. Birch-Hirschfeld: *Virchow's Archiv*, Bd. LXXXVII, I. Hofmeier: *Zeitschrift f. Geburtsk. una Frauenkrkh.*, VIII, 287. Zweifel: *Archiv f. Gynäk.*, XII, 251.

After birth very important changes also take place in the new-born infant. In the first place, the stump of the umbilical cord remains relaxed and bluish-white for about twenty-four hours, when the red line of demarcation begins to show itself, which soon becomes moist; beginning with the amniotic sheath of the cord, the gelatin of Wharton, and then the vessels are destroyed, while the rest of the cord appears flat, brown and mummified. When the vessels of the cord have become very thin, it falls off, usually while the child is in the bath, from the third to the sixth day; somewhat later in small or prematurely born children than in those who are strong. The umbilical arteries now shorten, and the remaining end of the cord is drawn into the umbilicus like a plug and stops it up completely, thus avoiding umbilical hernia.

With the first inspiration which fully distends the lungs, the blood streams through the pulmonary artery in greater quantity, and no longer passes through the ductus arteriosus Botalli; the blood returns from the lungs by means of the pulmonary veins into the left auricle and ventricle, and so to the aorta; arterial and venous blood are no longer mixed; the liver receives less blood, owing to the ligature of the umbilical vein, and there is hence less congestion of its capillaries and less secretion of bile, which fact was formerly used to explain the frequent occurrence of icterus neonatorum. The newborn infant is not accustomed to sucking, and should not be put to the breast very often. The colostrum, acting as a cathartic, causes free evacuations of meconium; the function of the skin, as well as that of the kidney, is very active; to which is added the not inconsiderable pulmonary evaporation, so that with all this outflow and very little income, it is not surprising that the child should lose in weight during the first three or four days. This loss, according to my observations, is about 250 grams on an average in the mature child, and continues until the stump of the cord falls off. It is of longer duration in a weak child, particularly when it is nourished artificially. The navel having healed up, if the child is healthy and nursed by a healthy mother, it begins to gain again about the fourth day, and by the seventh or eighth day is as heavy as it was at birth. The minimum weight occurs in the morning before nursing; it begins to gain during the day, and the maximum weight is obtained in the evening after the last meal, while during the night the child becomes gradually lighter.

According to Fleischmann, the daily and monthly increase (beginning with an initial weight of 3500 gm.) is as follows:—

	DAILY INCREASE.	MONTHLY INCREASE.
First Month	35 gm.	1050 = 4500 gm.
Second "	32 "	960 = 5800 "
Third "	28 "	840 = 6350 "
Fourth "	22 "	660 = 7000 "
Fifth "	18 "	540 = 7550 "
Sixth "	14 "	420 = 7970 "
Seventh "	12 "	360 = 8350 "
Eighth "	10 "	300 = 8630 "
Ninth "	10 "	300 = 8930 "
Tenth "	9 "	270 = 9200 "
Eleventh "	8 "	240 = 9450 "
Twelfth "	6 "	180 = 9600 "

The average temperature of the newborn child immediately after birth is 99.8° F. The influence of the first bath, etc., has been already discussed, and from this moment the temperature is pretty constant, varying in the course of the day from 98.8° F. to 99° F.; weak children have a lower temperature—98.8° F., 98.5° F., 98.7° F., 98.8° F. If there is a temperature of 100° F. to 100.4° F. on the fourth or fifth day, it indicates the presence of some disease in the child. In well-nourished children the temperature does not usually sink below 98.2° F., but this degree is usually noted about the fourth or fifth day. Boys have no higher temperature than girls. It rises to its maximum after nursing, and is on an average higher at noon than in the evening (*Bärensprung*, *Sommer*). There seems to be no difference between sleeping and waking, but when the child cries the mercury rises somewhat.

The urine of the newborn infant is slightly acid, pale yellow, and of a specific gravity from 1.005 to 1.007; there is often a sediment of uric acid in the kidney—uric acid infarction. The quantity is copious, and is passed from six to twenty times daily.

The evacuation of the meconium lasts three or four days, after which the stools become saffron colored, and are discharged three or four times daily. In the meconium are found lanugo, epithelial detritus and nuclei. The physiological icterus, which appears about the third to the fifth day, depends partly upon the lessened pressure in the hepatic veins, owing to the establishment of the function of respiration, which favors the passage of the bile into the blood, and partly upon the swelled condition of the capsule of Glisson, which is connected with the casting off of the umbilical cord (*Birch-Hirschfeld*). Hofmeier believes it is due to a dissolution of the blood, which is promoted by the liver (greater destruction of red blood-corpuscles), whereby an abnormal quantity of bile, very rich in pigment, is secreted.

CHAPTER V.

The Care of the Puerperal Woman.

Although the condition of the recently delivered woman is not pathological, still it is hard to draw the line between the physiological and pathological states. It is in many respects very peculiar, more like that of a wounded person, and requires proper diet and long-continued care and watching. The tendency of the female body to disease, upon the whole, is heightened by wounding, dilatation and tearing of the genitals, their ready accessibility to the external air; and furthermore, by the processes going on in the breasts. It is, therefore, of the greatest importance to the puerpera that the following precautions be carried out carefully, beginning with simple nourishment, cleanliness, rest in bed, pure air and avoidance of all excitement, whether of joy, sorrow or anger. Nothing is more injudicious and more often followed by serious results than carelessness during the puerperal state, and many of the long and tedious diseases of woman may be traced back to this period. Happily, the time is past when the care of the puerperal woman could be summed up in two words: Fasting and sweating. However, there are many prejudices which must still be overcome, as for instance, regarding the nourishment of the woman, the ventilation and lighting of the room, the nursing of the child, and bathing of mother and child. If the physician is firm and can give reasons for the rules he lays down, he will prevail. He is looked to for advice as regards the puerperal chamber; it should not be too light, but quiet, with a temperature of 63°–65° F.; it should be directly ventilated or indirectly by means of a neighboring room several times daily, so that no smell is noticed upon entering the room. The bed should be comfortable and the upper part of the body not too high; the body dry and warm, but not too heavily covered. At first, the woman should lie upon the back, but this is not absolutely necessary after the first days; after the fourth or fifth day she may be allowed to take any position that is most convenient to her. The patient should not get up before the ninth or tenth day, as the uterus has not yet recovered its former position, and displacement and hemorrhages are to be feared. She should first be put upon a sofa, and may then, after a time, be allowed to sit up upon this. Fainting spells are quite frequent when the bed is suddenly left, so that she should be given her breakfast before rising. At first, she must not stay out of bed longer than two hours at most, but may gradually increase this time. If hemorrhage occurs, she must be put back to bed at once. Every puerperal woman should be instructed to pass her water six or eight hours after birth, and if she cannot do this after repeated efforts, it should be drawn with a catheter, well disinfected, and not introduced under the clothes, but by exposing the opening of the urethra, and first carefully washing off the lochial discharge from its neighborhood. This should be repeated every eight hours if necessary. In the first two or three days, the diet should be scanty, the nourishment not too concentrated, and principally fluid in character; the mother must not be allowed to fast, especially if she nurses her child. The diet is as follows: According to von Voit's statements, a non-laboring woman should be given 85 grams of albumen, 30 grams of fat and 300 grams of carbohydrates, and a puerperal woman who nurses her child should at least be put upon the same regimen. Prof. Stumpf has arranged the following dietary for use in our clinic:—

Women in labor and puerperæ during the first day are given: Morning: ¼ litre of milk. Noon: ¼ litre of light meat soup, and the same in the evening. (Nutritive value: 11.3 albumen, 13.3 fat, 12.3 carbohydrates.)

Puerperal women the second and third day. Morning: ¼ litre of milk with a roll. Noon: Meat soup, an egg, a roll. Evening: ¼ litre of soup, as at noon, and a roll. (Nutritive value: Albumen, 29, fats, 19, carbohydrates, 78.)

From the fourth to the sixth day inclusive. Morning: ¼ litre of milk with a roll, or ¼ litre of coffee with a roll and 15 gm. of sugar. Noon: ¼ litre of meat soup, 100 gm. of boiled or roast veal, or custard, one roll. Evening: ¼ litre of soup with a roll. (Nutritive value: 52 albumen, 25 fats, 111 carbohydrates.)

From the seventh day on. Morning: ¼ litre of milk with a roll, or ¼ litre of coffee and a roll and 15 gm. of sugar. Noon: ¼ litre of soup, 100 gm. of beef without bones, ¼ litre of vegetables, a roll, ¼ litre of beer. Evening: Soup, 70 gms. of veal (boiled and without bones), or custard, a roll and ¼ litre of beer. Nutritive value: 69 albumen, 25 fat, 150 to 170 carbohydrates.)

This may be supplemented by one or two fresh eggs daily, or by increasing the milk, beer or meat about 15 to 20 per cent., or by substituting game or chicken for beef or veal. As the bowels, for the reasons above mentioned, do not usually move until the third day, it is well to give a simple injection of about a quart of lukewarm water the evening of the third or morning of the fourth day; if several of these do not suffice, then and only then a large spoonful of castor oil may be given in tea or coffee; an emulsion may be made with tr. aurant. and aq. cinnamomi, which is easily taken. As regards the treatment of the external genitals, perfect cleanliness is the principal thing, for when the lochial discharge decomposes upon the external genitals a penetrating odor is given off. Hence, the external genitals should be washed several times daily with lukewarm, salicylated or carbolized water and carefully dried without causing pain. A daily injection into the vagina of a three-per-cent. solution of boric acid (or 1 – 4000 corrosive sublimate) is very agreeable to most puerperal women, but this is not indispensable. The vulva should be covered by a wad of salicylated cotton and a three-cornered cloth fastened over this. Finally, the nursing puerperal woman should be warned against the use of drugs, and the attendant should be careful in the use of rhubarb, iodide of potassium, mercury, antimony and almost all of the metals, all of which remedies have been demonstrated in the milk after their ingestion. On the other hand, quinine and the narcotics are not open to this objection. Furthermore, we may influence the nursing child by giving the medicine to its mother, as syrup of the iodide of iron, for instance. If the mother can nurse the child herself, she should put it to the breast as soon as its cries testify to its hunger, that is, if she is not too exhausted by labor. This usually happens six or eight hours after birth. The child should be put to the breast at definite intervals, at most every two or three hours, and it is very well to accustom the child not to nurse from ten o'clock in the evening until six in the morning. Before and after nursing, the nipple should be bathed with lukewarm water. Usually the mother will find the lateral position most convenient for the child, in preference to laying it across the abdomen to suit the mother's convenience, for in this position the nipple is seized obliquely, the child cannot nurse or swallow well, it slips down upon the abdomen and fissures of the nipple more easily occur. A woman who desires to nurse her child should possess the following qualifications: Her breasts should be normal, *i. e.*, the nipples easily seized and not sore, the areola free from ulcers and eruptions. There should also be no scars or signs of a previous mastitis. Women who have previously had inflammation of the breast very frequently suffer from recurrence of the same trouble, owing to the irritation of the old cicatrices by nursing. Furthermore, the existence of diseases, as syphilis, gonorrhœa, chronic skin eruptions, tuberculosis, epilepsy and insanity, contraindicate nursing of one's own or another's child. Even in women with a history of tuberculosis in the family, nursing should only be permitted with great caution. Very excitable or passionate women should not nurse, as experience has shown that the quality of the milk may be changed by strong emotions.

If the mother cannot or should not nurse her own child, the best substitute is a good wet-nurse. The choice of the nurse should be left to the physician, for he alone is competent to judge whether this or that nurse is suitable for this or that child. In order to form a reliable opinion as to the eligibility of the wet-nurse, her own child should be seen, as one may most surely judge from its cleanliness and appearance the health and qualifications of the mother. If the child in question is well nourished, free from constipation and the stools of normal consistency, and if it sleeps well, this testifies to the quality as well as the quantity of its mother's milk. The best age for a wet-nurse is between twenty and thirty-five years, and those who have already nursed a child should be given the preference, as they know from experience what food gives the most milk, and, in fact, know all about the condition in question, and also because they do not worry so much about losing their milk. Country women are to be preferred to those who live in the city. It is also beneficial to the nursing child that the wet-nurse be of much the same disposition as the child's mother, and that she have been delivered at about the same time, for the age of the milk alters the proportion of its constituents; the casein, for instance, increases in quantity until the end of the second month, as also does the amount of sugar, while the fat decreases from month to month. The nurse, as a rule, should not have been confined over six or eight weeks before the mother. In any case, the rule should be adhered to, that whether the ages of the two children are different by several months or not, a bluish milk containing sugar should be chosen for the younger, and one rich in casein and fat for the elder child. Trustworthy evidence should be furnished by the nurse in order to avoid deception in regard to the date of her labor. Newborn infants who take the breast of one who has already nursed for several months are very liable to suffer from indigestion, especially flatulence, colic, and also constipation; they cry a great deal, and are prone to disease of the stomach, because they have difficulty in digesting the milk. It is advisable to investigate the nurse's family history, whether the parents have had gout, eruptions, etc., who the father of the nurse is, and whether his health is good. If the nurse has an excess of milk, it is advisable to allow the milk to run off before each period of nursing, otherwise, the child is apt to swallow the milk too quickly, and thus overload its stomach and suffer from disturbances of digestion. Nurses of this class must be warned not to give the breast too frequently or too long, else the children will become too fat. Sometimes, in such cases, it is necessary to cut down the amount of fat and meat given to the nurse.

According to the French physician Lampérière, the breast of a healthy woman gives off 50 to 60 grams every hour; this may be tested by drawing the milk out with a breast-pump. Sometimes very desirable nurses notice a perceptible decrease of their milk during the first days of their service, which is only temporary, however. This is probably largely due to the change of her mode of living, the separation from her own child, and the natural embarrassment caused by her new position. This should be borne in mind, and an unnecessary change of nurses will thereby be often avoided. The following articles of food increase the supply of milk: bread and butter, custards, eggs or dishes made of eggs, milk-broth, thick soups, meat of all kinds, and dry mealy vegetables, peas or beans pressed and made into soups and purée, beer, and coffee with milk. The former diet of the nurse must be taken into consideration, for instance, the dishes which she has previously liked and enjoyed, otherwise indigestion might result, which would interfere with the formation of the milk. A nurse from the country, accustomed to an almost entirely vegetable and milk diet, should not at once be given meat daily, but the usual diet should be continued for a certain period of time, as long as it suffices for the supply of milk. These foods do not all directly increase the secretion of the milk, as is seen when linseed-bran refuse is given to cows to increase their milk. Moleschott mentions the fact that chestnuts increase the quantity of milk. Sugar in the form of sugar water, or administered by sweetening many of the dishes given the nurse, as milk and dishes containing milk, is to be recommended, but, on the other hand, she should not use an excess of salt, for this, when present in great quantity, is apt to decompose the milk; moderate salting of the food may be permitted, but nurses should not be allowed to eat salt herring or too salty meat. Furthermore, she should not be allowed to take the child to bed with her at night in order to give it the breast; on the contrary, she should get up herself if it be necessary to nurse the baby. The mother should observe the child carefully during the first week after birth, while it is at the breast, and it will soon be seen whether the nurse is suitable to the child. The baby should be weighed at regular intervals to test the effect of this mode of nourishment. If its weight increases, and the stools are regular, the sleep quiet; if it does not cry too much and becomes bright and flourishing, and free from eruptions upon the head and body, the nurse is satisfactory. But if the baby is continually restless, with flatulence, colic, and diarrhœa; if it becomes thin, pale and covered with eruptions, the milk of the nurse in question is obviously not beneficial to the child, and its nourishment must be furnished by another nurse, or by other means.

CHAPTER VI.

The Care of the New-Born Infant.

LITERATURE.

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The *child's clothing* should fit well, but not too tight, it must be warm enough, and especial care should be taken of the navel—navel dressings of salicylated cotton should be provided, with a bandage. It should sleep in a cradle or bed, but never in the mother's or the nurse's bed. The cradle should be kept warm in winter by hot bottles. The infant should be bathed every day in water at 92° F., and immediately enveloped in a flannel cloth and carefully dried. More than this, when the child wets itself, it should be carefully dried, otherwise the parts become excoriated. The eyes should be washed out with a very fine piece of soft linen, and its mouth should be washed out each time after it is given the breast, that sprue may be avoided. All "sugar teats" are harmful. The mother's milk alone suffices usually, and also keeps the bowels regular; hence, sugar water and all sorts of teas are superfluous. The genitals and anus, as well as all of the depressions upon the body must be carefully cleaned, and intertrigo thus avoided. Healthy children may be taken out in two weeks in summer, when the air is warm and there is no wind; in winter or as long as it is frosty, the child should not be taken out until it is a year old. Weaning from the breast should take place gradually about the time the first teeth are cut, at about the ninth to the twelfth month. These are the most important rules when the child is nursed by the mother. If, however, it is to be raised upon the bottle, the physician must watch the child's condition more carefully and observe the following points:—

Choice and Preparation of the Nourishment.—The cheapest, most easily procured, and when properly prepared the best, substitute for the milk of the mother is cow's milk; not the milk of one cow alone, but that of several mixed together. There is no doubt that disease germs may be transmitted by the milk. The infection of the milk may be due, however, to the water mixed with it, or it may be specifically infected and serve as a medium for the development of the germs of disease, or simply be the bearer of them. Scarlatina, for instance, has been communicated to a young milking cow (*Klein*), and diseases, like the foot-and-mouth distemper, have been transmitted. Thursfield has proven that milk epidemics occurred almost exclusively among the customers of those dealers who contract to deliver a certain amount of milk daily, so that they sometimes mixed the milk of sick and pregnant cows, and also added a quantity of water. The only safeguard against individual infection is to boil the milk before its ingestion. The first point of importance in safely nourishing a child by means of cow's milk, is to provide milk in which no product of fermentation or deleterious organisms are present. Thorough sterilization of milk is very difficult to accomplish, and also very inconvenient, and one must be satisfied if the very obstinate, resisting lactic acid ferment may be so weakened that the milk will keep for three or four weeks without getting sour. This degree of sterilization is attained by boiling the milk for thirty-five to forty minutes in closed flasks. Analogous to the conditions of natural nourishment, the milk must be protected from the time of its preparation until it is received by the child. In order to fulfill these demands, Prof. Soxhlet (Munich), from one of whose lectures I have taken the directions word for word, has invented a very useful and practical apparatus, which is manufactured in New York by C. Riessner & Co., and may be ordered through dealers. I will not describe the apparatus here, as it is well known, but will only emphasize the facts that it has been successfully used in many cases, that it has been tested in every respect and not found wanting, and that children nourished in this way thrive and flourish exceedingly well. The milk must, of course, be recently warmed before it is given to the child. Soxhlet describes how this is done in his directions for the use of the apparatus.

The position of the bottle during nursing is also of importance ; it should not press too strongly against the hard palate, and the milk ought not to flow out too freely, lest it be swallowed too hastily and be vomited up again. The milk should not be too rich in fat, and must be sweetened and diluted with water, according to the age of the child. In weak children or those who are subject to catarrhal troubles, instead of mixing pure boiled water with the milk, a few fennel or linden blossoms or arrow-root water (one teaspoonful of arrowroot is stirred up in two cups of boiling water until a thin viscid fluid results), or barley water or oatmeal water may be added. Küttner recommends the addition of ½ to 1 teaspoonful of finely powdered gum arabic to a large cup of milk, but this must be carefully stirred until it is dissolved. When the child is satisfied, it rejects the milk and remains quiet, or after taking the bottle sleeps quietly for two or three hours. The quantity of milk yielded by healthy mothers, as stated above, gives us an idea, approximately, of the quantity of milk that should be administered artificially in twenty-four hours. These figures also show that the calculations of a French commission, according to which 200 gm. of milk and 30 gm. of sugar daily during the first month, 400 gm. milk and

40 gm. of sugar for the second month, and 670 gm. of milk with 50 gm. of sugar during the sixth month, are not correct, and that these quantities are much too small for the nourishment of the child. If the child continues well upon the above diet, the milk may be given more frequently in larger quantities and less diluted, but it should be remembered that a second quantity ought not to be given until the first has been digested. About the fifth or sixth month, if the child remains healthy, the milk may be gradually less diluted, until it is given unmixed. For more than thirty years the condensed milk of the Anglo-Swiss Condensed Milk Company, in Cham, Switzerland, and that of the Swiss-German Company in Vivis, Kemplen and Sassin (Hungary), has been used as an important substitute for fresh cow's milk. This is condensed cow's milk, which has been sugared and heated by steam in chambers filled with rarefied air; it is hermetically sealed in tin cans, and may be had of most grocers. It states upon the can that it should be diluted 1 : 7, but this is too concentrated for the first month and is also too sweet. At first, to one part of this milk should be added fifteen parts of water; later on only twelve. It is thought by some that the great quantity of sugar in condensed milk predisposes the child to rachitis; hence in the first three months the milk was diluted 1 : 22, and later on reduced to 1 : 18 and 1 : 12, also adding a dessertspoonful of a solution of legumin three or four times daily (one dessertspoonful in a gill of boiling water), with a little salt.

Each portion must be freshly prepared, first testing the milk with litmus paper to detect acidity. Sometimes the addition of a little arrow-root makes the milk more pleasant for the child. Jacobi's experience leads him to think the admixture of barley water checks the tendency to the formation of acid in condensed milk and prevents diarrhœa and other evils in children thus nourished. The results attained by condensed milk are better in the earlier months than later on, when it is not nutritious enough, and must be replaced by Scherf's milk. Recently the favorite Rotterdam method of nourishing the child with buttermilk has been recommended in Germany. A spoonful of fine flour is added to a litre of buttermilk and boiled until a thin pap is produced, to which 0.8 to 1 gram of sugar is added. If diarrhœa occurs, rice should be substituted for the wheat-flour. Others give their children rice water, barley water, or a decoction of salep, isinglass, arrowroot or maize flour or "maizena." Subsequently, Nestle's food became popular, a fine yellow powder of sweetish taste, like zwieback, which, according to Jacobsen, is composed of pulverized flour, the yelk of egg, condensed milk and sugar, and is boiled with from six to ten parts of water, according to the consistency desired. Children seem to like this and thrive well upon it. Morpain, who used it in a hundred cases, maintains that by this food the mortality of children was reduced more than 50 per cent., as compared with other methods of nourishment. Foods which contain starch are not advisable before the development of the teeth, as the secretion of the salivary glands is wanting, and hence they are not digested. Faust and Schuster's foods are similar to Nestle's food; likewise that of Giffey, Schiele & Co., of Rohrbach, in Baden. Prof. Vittstein, of Munich, recommends a similar preparation made by Theodore Timpe, of Magdeburg, which is pleasant to the taste and easily digestible. Furthermore, another preparation, called leguminose, is recommended by Prof. Beneke, of Marburg, which is finely divided and easy of digestion, and has been demonstrated by Hartenstein to contain its nutritive material in the same proportions as in cow's milk, in mother's milk, in the simple diet of adults, and in beef. In children who vomit readily, and in patients whose digestion is weak, this preparation has rendered good service.

In very emaciated children one to two teaspoons of cream may be added to the solution of leguminose. A teaspoonful of leguminose is added to a cup of hot water. This soup is given infants, two or three months old, at first in the strength of one part to ten parts of water, and subsequently stronger. It must, however, be observed that many of these children who were dependent upon these foods for their nourishment, gained very little in weight and became rachitic in many cases. Liebig's extract is also another preparation which, according to recent statistics, has not been so serviceable as was at first supposed; it should likewise only be used in children two or three months old. Dr. Biedert allowed cow's milk to stand for some time, then skimmed off the cream, and mixed it with boiled water, the whole mixture being again boiled and then preserved for use. He recommends six mixtures, as follows:—

(1) 8 parts cream, 24 parts boiled water, 1 part milk sugar.
(2) 4 “ milk, 8 “ cream, 24 parts water, 1 part milk sugar.
(3) 8 “ “ 8 “ “ 24 “ “ 1 “ “ “
(4) 16 “ “ 8 “ “ 24 “ “ 1 “ “ “
(5) 24 “ “ 8 “ “ 24 “ “ 1 “ “ “
(6) 32 “ “ 16 “ water, and 2/3 of a part of milk sugar.

He passed gradually from No. 1 to No. 6, and then to pure cow's milk, which was, however, replaced by one of the above mixtures as soon as undigested casein was found in the stools. Many children, however, cannot stand so much cream. The ideal nourishment we are all striving to obtain, namely, "the simplest mode of preparation, together with the greatest digestibility, is with difficulty thus obtained." (*Jacobi.*)

Where there is any doubt as to the child's bodily development and proper increase of weight, whether it be nourished by the mother or wet-nurse, or by artificial means, the scales should be used to determine this question;

the child ought to be weighed several times weekly. After the eighth day, it should increase in weight 20 to 35 grams daily for the first four months, and 10 to 15 grams daily after the first five months. A child who does not gain 17.5 grams daily for the first and even for the second month, is not entirely healthy or else does not receive sufficient nourishment of an appropriate character.

PART IV.

PATHOLOGY AND THERAPEUTICS OF PREGNANCY.

INTRODUCTION.

LITERATURE.

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If we were to discuss all the diseases occurring during pregnancy, this part would become excessively long, out of proportion to the frequency with which these cases come under the physician's observation. Their study is of special interest, however, in so far as it decides the very important question as to the changes various diseases undergo during pregnancy as regards their intensity, course and fatality, as well as that of their transmission to the fœtus. The acute infectious diseases, such as measles, scarlet fever, small-pox, cholera, typhoid fever, although of rare occurrence during pregnancy, furnish opportunities for observing some facts which can be determined only during that condition. We mention, for example, the occurrence of small-pox in the fœtus in utero, while the mother continues in good health. Her blood contains a poison which does not injure her, because she has obtained immunity by a previous illness; but this poison affects the fœtus. Another instance is syphilis of the fœtus derived from the father, the mother being exempt from this disease. The almost invariable and rapid transmission of dissolved substances, such as iodide of potash, salicylic acid, and ferrocyanide of potash, as well as chloroform, oxygen, and carbonic acid gas, has been clearly demonstrated. But formed bodies are not so constantly transmitted from mother to child, and the fact is especially noteworthy that of several fœtuses of the same mother some are infected, while others may remain exempt. Of certain microphytes we know that, as a rule, they do not pass through the placenta of gravid animals; among these is the anthrax bacillus. Sangalli, however, discovered anthrax bacilli in the blood of a fœtus whose mother had died of carbuncle, while Morisaud, in the case of a gravida near term, who suffered from malignant pustule and bore a dead child, found the fœtus free from bacilli.

Spitz and Albrecht have proved the transmission of the spirillum of relapsing fever to the fœtus in utero. The streptococcus of pyæmia is transmitted to the fœtus in the rabbit (*Simone*), and there is no doubt that this also happens in man. The only case of probable congenital tuberculosis known in human pathology is one communicated by Charrière in 1873, in which a woman of 29, after suffering from pleuritis and caseous pneumonia for four months, gave birth in the eighth month of pregnancy to a child which died after three days, and was, as shown by the post-mortem, affected with general tuberculosis, especially of the abdominal organs. The mother died in childbed, of pulmonary tuberculosis.

Leale observed two cases of intra-uterine transmission of scarlet fever; in both cases the mother died and the children survived. Lebedeff reported a case of an erysipelatous mother who gave birth to a child which weighed 1300 grams and died ten minutes after delivery. There were numerous excoriations of the skin in the form of red spots, with whitish, somewhat isolated elevations. Microscopic examination showed the presence of erysipelas cocci in the lymphatic ducts and spaces, particularly in the subcutaneous tissue and that of the umbilical cord. There were none in the blood and placental tissue.

Variola, typhus and cholera furnish additional observations. In animals, the transmission of microphytes in rabies (*Perroncito*), glanders (*Löffler*), anthrax (*Arloing*), and chicken cholera (*Strauss* and *Chamberland*), has been positively ascertained. We conclude, therefore, that the great majority of pathogenous micro-organisms possess the power of passing through the placental barrier and of effecting an intra-uterine infection of the fœtus—a peculiar kind of infection by contact (*Bollinger*), in which the size and spontaneous movements of the bacilli, the duration of the disease, the power of resistance of the placenta, and other accidental circumstances, play their part. They may pass through the inter-villous placental spaces, lined with endothelium and filled with the mother's blood, without injuring them; as they may penetrate the uninjured skin, the mucous and serous membranes, and the normal lungs, and may be excreted through healthy organs, such as glands, mucous membranes, and kidneys.

In the same category belong, also, the important observations of diseases of certain organs due to pregnancy, such as the kidneys, liver, heart, etc.;

furthermore, the question of the immunity of pregnant women from certain infectious diseases, and, on the other hand, of their increased predisposition to other affections, such as skin diseases, struma, pernicious anæmia. Finally, women suffering from organic diseases not rarely become pregnant: hence the question as to the influence of gravidity upon them becomes practically important, since it may justify an artificial interruption of pregnancy, and even the sacrifice of the fœtus in order to save the mother.

In this section, therefore, we are concerned not alone with diseases arising from the sexual organs and the fœtus, but we must also make frequent excursions into the domain of internal medicine. The subjects we have to deal with are: *of general diseases*, anæmia and chlorosis, syphilis, and the various kinds of spasms, chorea, epilepsy, hysteria; *of skin diseases*, pityriasis, urticaria, psoriasis, measles, smallpox, scarlet fever; *of affections of the abdominal organs*, diseases of the bladder and kidneys, affections of the liver, diseases of the stomach and intestines (typhoid fever), hernia, and uncontrollable vomiting; *of the lungs*, tuberculosis, pneumonia and pleuritis; *of the heart*, valvular lesions, endocarditis and myocarditis; *of the brain*, the psychoses of pregnant women.

In conclusion, we shall add a chapter on wounds of the pregnant woman and the child.

All the above-mentioned anomalies will be considered only in so far as they are of importance to the condition of the mother and her fœtus, causing disturbances as regards the duration of pregnancy or the nutrition of one or the other. Affections which evidently cause no disturbance until delivery, even though they existed for some time during gestation, will be discussed under the head of "Pathology of Labor" (eclampsia, for example).

We shall begin with the diseases of pregnancy.

SECTION I.

Affections of the Sexual Organs.

CHAPTER I.

Nutritive Disturbances of the Vulva, Vagina and Cervix. Vulvitis, Colpitis, Endometritis Gravidarum, Mycosis Vaginæ, and Colpohyperplasia Cystica.

LITERATURE.

Cavallini, D.: "Vulvo-vaginite follicolare complicante la gravidanza." *Rassegna di sc. med.*, Modena, 1886, I, 548. **Donat, J.**: "Ueber einen Fall von Endometritis purulenta in der Schwangerschaft." *Archiv f. Gynäk.*, 1884, XXIV, 481–486, 1 Tafel. **Veit**: "Endometritis in der Schwangerschaft." *Berl. klin. Wochenschrift*, 1877, XXIV., 641–644. **Winckel**: "Lehrbuch der Frauenkrankheiten." Leipzig, 1886, 159. **Steinschneider**: *Berliner klinische Wochenschrift*, 1887, Nr. 17.

Simple vaginal catarrh, acute as well as chronic, is frequently found in pregnant women. The vaginal mucosa is softened, swollen, of a dark violet color, and the columnæ and papillæ project as swollen, millet-seed-sized nodules, imparting to the finger the sensation of a grater. The secretion is first glairy, then milky, finally purulent.

In *mycotic colpitis* we find scattered whitish spots (resembling aphthous patches) with reddened bases, extending from the ostium vaginæ to the os uteri. Haussmann has succeeded in inoculating the fungus upon the vaginal mucous membrane. In 14 per cent. of pregnant women the following fungi are found: (*a*) the *leptothrix vaginalis*, with short, sometimes branching threads and oval spores, which may be inoculated; (*b*) *segmented* fungi with broader filaments—the *oïdium albicans*, according to Hallier and Haussmann. Haussmann once found a sporangium of this fungus in the vagina: the spores rising from the mycelia are smoothly rounded off or set with round, oval or pear-shaped conidia, often containing a nucleus. (*c*) *Trichomonas vaginalis* was first discovered by Scanzoni; it is of an oblong, round or biscuit-shaped form, with from one to three flagellæ, and a thicker, stiff, tail-shaped appendix at the other end; at times it moves actively, and is met with in the normal vaginal secretion.

Colpohyperplasia cystica is another not infrequent complication of vaginal catarrh, the detailed description of which will be found in my text-book on diseases of women. It is always connected with severe, frothy leucorrhœa, great redness and swelling of the mucous membrane; it affects mainly the upper two-thirds of the vagina.

The most important disease of these parts of pregnant women is blennorrhœa. It is produced by a diplococcus (the gonococcus), discovered by Neisser, of Breslau (see Fig. 45); they are circular, uncommonly large micrococci, 0.83 mm. in diameter, and are deeply stained by methyl violet; they are generally seen in pairs, resembling a biscuit, and form groups which are united into a colony by a mucous covering. Their form and arrangement as diplococci is characteristic, each individual showing an oval shape, flattened on the side, turned toward its fellow, so that each pair may be likened to a coffee bean or a screw head, or the diplococci may be inclosed in cells in irregular groups or hives (*Steinschneider*). Oppenheimer found them in 27.7 per cent. of pregnant women, Lomer in 28 per cent. According to the most recent investigations by Steinschneider, they are invariably found first in the urethra, in almost half of the cases (47 per cent.) in the cervical, and just as often in the uterine, mucous membrane, and, finally, sometimes in Bartholini's glands. But the gonococcus does not lodge in the mucous membrane of the vulva and vagina of adults, and is carried there only by the secretions of neighboring affected organs. The cause of the immunity of the vagina has not yet been discovered.

In *gonorrhœal endometritis*, the mucosa is deep red and bleeds readily; the lips are often everted and show losses of substance; frothy pus oozes out between them. Cystic dilatations of the follicles at the edge of the external os are frequent, even in non-infected persons; but it should be remembered that in the glairy mucous secretion which issues from an os free from swelling, erosion and pain, numerous swarms of gonococci are sometimes found, and may exist in the secretions of the cervix and corpus uteri for a long time without necessarily giving rise to inflammatory affections of these parts, so that the cervix, likewise, is one of the chief seats of chronic gonorrhœa (*Steinschneider*). Some doubts have been thrown on Sänger's assertion that gonorrhœa frequently causes abortion and inflammatory affections late in the puerperal state, by Kroner's investigations, by Steinschneider's results mentioned above, and by Ziegenspeck's investigations on parametritis; my clinical experience, however, points to a rather frequent connection between the two. A case reported by Donat is interesting. He found, between the amnion and chorion, pus with blood-corpuscles and fibrin, and around the circumference of the placenta upon the chorion, jagged remnants of a thickened decidua likewise infiltrated with pus; gonococci could not be demonstrated. The patient had been suffering from discharges and hemorrhages for years. Premature labor took place in the ninth month, the waters having been discharged three days previous.

Symptoms.—Burning pains during micturition, excoriating leucorrhœa, reddening and some soreness of the external genitals, lumbago. When the leucorrhœa and disease extend to the endometrium, and the lower part of the ovum is bathed in the secretion, the membranes are eroded and softened, like the external genitals, and this condition is not rarely followed by early rupture of the membranes and premature labor.

If the membranes have not previously broken, they may rupture too early in labor. This form of colpitis and endometritis is often associated with imperfect contractions and increased temperature. Finally, in gonorrhœal endometritis, the child may become affected with ophthalmo-blenorrhœa. The *diagnosis* is made by palpation (the swollen papillæ being recognized by the touch), by inspection through the speculum, and by the microscope.

Treatment.—Injections of mild astringents and antiseptics are locally indicated. Frequent cauterization of the diseased places by silver nitrate in solution (2 per cent.), through a tubular glass speculum, is advisable. Tampons of tannin and glycerin, or a decoction of oak bark, and application of iodoform might be tried in obstinate cases. Of more importance are injections of corrosive sublimate or permanganate of potash (1 : 1000). Internally, neutral salts, bitter water, emulsions and plain diet may be administered; but no spirituous liquors. Colpitis granulosa frequently disappears spontaneously in the puerperium. In colpohyperplasia cystica the catarrh only requires treatment in the manner just indicated; the cysts disappear spontaneously during labor, and the entire affection generally passes away in a few days after delivery.

CHAPTER II.

Displacements of the Genital Organs. Inversion of the Vagina, Descensus and Prolapsus of the Gravid Uterus.

LITERATURE.

Busey, S. C.: "Cystocolpocele Complicating Pregnancy." *Amer. J. Obst.*, N. Y., 1887, XX, 925–928. Dufour: *Monatsschr. f. Geburtsk.*, Bd. XVI. v. Franque: "Uterusvorfall." Habil.-Schrift. Würzburg, 1860, 14–16. Gusserow: *Monatsschr. f. Geburtsk.*, Bd. XXI, 99. Hueter, V.: *Monatsschrift f. Geburtsk.*, XVI, 1860. Kleinschmidt: *Centralblatt f. Gynäk.*, 1885, p. 480. Lindemann: *Allgem. med. Centralzeitung*, 1878, Nr. 102 und 103. Marschner: *Centralbl. f. Gynäk.*, 1885, p. 122. Simpson, O. O.: "A Case of Prolapsus of the Vagina Preceding Labor." *Atlanta M. and S. J.*, 1885–86. N. S., II, 274. Spancken: *Archiv für Gynäk.*, Bd. XVII, 128 (containing the literature). Walcker, W. (Texas): *Centralbl. f. Gynäk.*, 1879, 479.

Inversion of the vagina is a folding over of the anterior or posterior vaginal walls, or of both, into the lumen of the vagina or through the external genitals; the region of the tuberculum vaginæ is most frequently inverted. This condition is very often connected with vaginal cystocele (of which we shall speak elsewhere), less frequently with vaginal rectocele. The displacement of a gravid uterus (stated by V. Hueter to have been first described, in 1763, by Antrobus, of Liverpool) may be a *descensus or a prolapsus incompletus or completus*. Only the first two are of common occurrence in pregnancy. A complete prolapsus of the gravid uterus (since it has been repeatedly observed by the author in the unimpregnated organ) may occur, without doubt, even in the first half of pregnancy; but the reported cases of this degree of displacement during labor—even those of recent date—have failed to stand the test of criticism. The entire uterus is even said to have protruded (in Lindemann's case) after a labor of 24 hours' duration, which, as Fehling remarked, is surely incorrect, since, owing to the enormous stretching to which the vagina would be subjected, laceration of this organ would be inevitable. Dufour, indeed, found a uterus hanging down as far as the knees, as did Boissard; but in these cases the uterus had not prolapsed in toto. Displacement of the organs named produces erosions, ulcers and lacerations of the vagina and lips of the cervix, with œdema and passive hyperæmia of the walls. These changes hinder the expansion of the cervical canal in labor. In severe cases, dilatation of the bladder, the ureters, the pelvis and calyces of the kidney, and sometimes even purulent inflammation of these parts, are almost inevitable consequences of the displacement. As a rule, only the greatly hypertrophied cervix protrudes through the external genitals. The case related in the appendix shows how enormous the swelling of the soft parts or of one of the lips of the cervix may become.

Symptoms of Prolapse.—The patient complains of a feeling of pressure, with or without acute pain, and notices a tumor protruding between the external genitals. If sudden in its onset, nausea and vomiting may arise from stretching of the peritoneum; but the displacement generally develops slowly, and sometimes causes only slight inconvenience. Gradually painful micturition sets in, owing to a traction on and displacement of the bladder. The height of the fundus uteri, as a rule, almost exactly corresponds to the month of pregnancy present. The discharge, as well as the injury which the uterus is liable to sustain, sometimes cause abortion (16.5 per cent.). If the prolapsus was present before conception, the uterus recedes spontaneously in the first months; but it may, on the other hand, again descend deeper in the following months. The prolapsus may be so marked as to interfere seriously with sitting or walking. A formerly prolapsed uterus may remain entirely in the pelvis, even during the second half of pregnancy, and in such cases labor will proceed naturally. Similar cases have been observed by Bluff, Richter, Jördens.

The organ does not always recede, however, and then reposition and retention become necessary during pregnancy. Constriction and strangulation of the uterus may occur, which would render reposition impossible (*Reinick*) and cause death. Owing to hypertrophy of the cervix in prolapsus uteri and the pathological changes about the external os, labor is retarded and the walls of the organ are compressed more strongly, the child advancing into the cervix. Walker found, *e. g.*, the head of the child with the cervix, during labor, protruding 14 cm. beyond the vulva; with each pain the head advanced 3 cm., but was held fast by the firmly-contracted os externum. Lacerations and contusions of the soft parts may occur; the induration is sometimes so firm that it does not yield (*Kleinschmidt*), and the child perishes owing to the increased resistance and greater pressure. It is very remarkable that in 69 cases of prolapsus of the gravid uterus breech positions were found 9 times (two or three times as often as usual). The child's head remains, as a rule, in the small pelvis during labor; but, unless the cervix is reposited, the child's head can enter it through the pelvic outlet, thus necessitating its extraction from the cervix below the outlet.

Diagnosis.—The prolapse of the uterus having been ascertained by finding the cervix at the vulva, we must try to discover whether the uterus is pregnant; whether neighboring organs (bladder or rectum) are present in the folds of the displaced vagina; how much of the uterus has descended; and, finally, whether there are any complications, such as tumors of the pelvic organs, etc.

Etiology.—A case of acute prolapsus of the gravid uterus was observed by Vere Webb twenty weeks after conception, in consequence of over-exertion. In one-half of the cases, prolapse existed before pregnancy; conception followed cohabitation after reposition or by intromission of the penis into the os uteri. Prolapsus in pregnancy is also brought about gradually when a growing ovarian tumor above pushes the uterus through the vulva—an instance of which came under my observation. In 14 out of 69 parturient women the prolapse did not occur until labor. The prolapse may develop acutely in pregnancy as well as during labor, owing to excessive straining, falls, blows, coughing, etc. Great rigidity of the lower part of the uterus, which fails to soften under the pains, may also cause prolapse, though this is rarer than the direct withdrawal of the uterus during extraction of the child or placenta by the obstetrician or midwife. It is hardly correct to maintain that excessive width of the pelvis or vagina causes or even predisposes to a prolapse, for these parts do not contribute materially to the support of the uterus; if the entire pelvic floor were normal, the uterus would not descend, in spite of such anomalies.

Course and Prognosis.—In most of the above-mentioned cases pregnancy will go to term; only about one-sixth end in premature labor. As stated above, abnormal positions of the child, especially footling presentations, are frequent; leucorrhœa and excoriations during pregnancy, and during labor anomalous pains and incarceration or swelling of the soft parts, require treatment. It is, however, a highly important fact that after childbed prolapse ordinarily reappears to a greater degree than before, unless energetic measures are resorted to. These may succeed in obtaining marked improvement in the puerperium; but it is not right to tell the patients that they would improve their condition by a new pregnancy. On the contrary, we should rather call the attention of pregnant women to the evil consequences that may result, and to the necessity for an operation.

Treatment.—The obstetrician has to meet two indications. 1. *Reposition.* This should be done in the dorsal or lateral position after emptying bladder and rectum, and as soon as the diagnosis is made. The prolapsed parts are seized carefully with the right hand and pushed upward in the direction of the pelvic axis, repositing the vagina at the same time.

Unless the constriction is too firm, we begin by taking hold of the entire prolapsed part. If reposition does not succeed readily and the parts are swelled considerably, we must scarify them (*Lusk*) very carefully, since a withdrawal of blood from a pregnant uterus is not without danger. Narcosis was formerly employed only when the prolapsed uterus was incarcerated and the manipulations proved very painful; nowadays, if the patient were too sensitive to pain, we would apply a 4 to 10 per cent. cocaine solution with a brush. After reposition the woman must rest in bed in the dorsal position, and a tampon saturated with glycerin be inserted; after a while she may walk about again, if protected by Credé's catamenial bandage. This proceeding sometimes suffices in very marked cases of prolapse (*Marschner*).

2. The second indication consists in *retention.* Pessaries are by no means harmful: they never cause abortion; there is no case on record to dispute this fact. But they must be carefully selected, be round, soft, and cause no pressure; sometimes a simple T-bandage will do. These instruments are, of course, superfluous during labor; simple replacement of the prolapse and lateral position of the parturient being quite sufficient.

Whenever the uterus is large enough to maintain its position above the pelvis, the pessary may be removed, say, in the fifth or sixth month.

Ulcerations generally heal quickly after reposition, if the uterus be retained. Recovery is promoted by injections of boracic acid, carbolic acid or sublimate. Should the hypertrophic cervix alone have protruded from the vulva, and the vaginal wall be but little, if at all, displaced, an amputation of the cervix may be performed, even in the earlier months of pregnancy, by constricting it with a ligature fastened by sutures, then quickly removing the cervix with a knife below the ligature, and sewing the edges together carefully with silkworm gut. Then the ligature is removed, and if there be any bleeding, other sutures are introduced; but I have never been obliged to do so. If pessaries be used, the operation may, as a rule, be postponed until after childbed; after normal involution of the organ an operation may be altogether unnecessary. The question as to whether an operation for retention of the prolapsus by means of anterior or posterior colporrhaphy be possible and admissible during pregnancy must be answered in the affirmative. I have performed it once, not knowing that the patient was pregnant, she having been under my treatment some time previously. The depth of the prolapsed and enlarged uterus was again measured by the sound before the operation. No abortion ensued; the prolapse having been cured, the patient passed through a normal confinement without any reopening at the site of the operation. But at least two or three months must intervene between the operation and labor, otherwise the cicatrix would still be too fresh and yielding. But since in nearly all methods of prolapsus operations during pregnancy the loss of blood is much greater than at other times, and the prolapsed uterus can be well retained by pessaries, and the mother or child may be injured by loss of blood or eventual suppuration, the operation should not be performed during pregnancy without urgent necessity, and rather be postponed until a few weeks after delivery. The parturient may assume a dorsal or lateral position during labor. Kleinschmidt was compelled to apply the forceps to the child's head in the uterus, and to make deep incisions because the cervix failed to yield. If lacerations occur, silkworm gut sutures must be used for reuniting them post-partum.

Illustrative Case.—Prolapsus uteri gravidi, second vertex position, labor at full term, extreme incarceration, and swelling of the anterior lip of the cervix which protruded somewhat from the genitals. Forceps. Living boy.

Mrs. B., a medium-sized, thin blonde, delivered several times before by forceps, was pregnant for the seventh time; the uterus, which had been prolapsed, had receded in the beginning of pregnancy, but subsequently prolapsed again even to a greater degree. The waters escaped an hour before labor began. The pains were good at first, but the lips of the cervix swelled gradually, and the cervix did not dilate; when the physician after nine hours tried to use the catheter (on account of the retention of urine) and failed, he sent for me. I found the uterus very strongly contracted, the bladder greatly distended; from the external genitals protruded a pale, bluish-red, transparent, cyst-like tumor, the size of a fist. At the first glance I supposed it to be a cystocele filled with urine, but soon found it to be an enormous, swelled, œdematous anterior cervical lip. The head stood transversely in the second vertex position. The introduction of the silver catheter succeeded rather easily, and when a large quantity of urine had been evacuated, I applied the forceps on the ordinary bed without narcosis and extracted with some difficulty, at the same time keeping back the cervical lip. The living, vigorous boy had to be extracted by means of the shoulder. Then I expressed the placenta without any further protrusion of the cervix. During the extraction a bleeding longitudinal fissure appeared near the centre of the inner surface of the anterior lip. Having removed the placenta, I reposited the prolapsed uterus and ordered the lateral position. The puerpera soon recovered.

CHAPTER III.

Retroversion and Retroflexion of the Pregnant Uterus.

LITERATURE.

Hers, J. F. P.: "Een genal van retroflectio uteri gravidi in de zesde zwangerschapsmaand." *Nederl. Tijdschr. d. Geneeskunde*, Amst., 1883, XIX, 247–249. Proff, Ernst: "Ueber die Rückwärtsbeugung der schwangeren Gebärmutter." Halle, Karrus, 1883, 38 pp., 8vo. Veit, G.: "Retroflexion in den späteren Monaten der Schwangerschaft." Volkmann's Sammlung klin. Vorträge, 170. Containing the literature.

We call a pregnant uterus *retroverted*, when it is so rotated about its transverse axis that the fundus is displaced backward from the pelvic axis, and the mouth of the womb forward, and without flexion of the long axis so as to form an angle. If the latter be the case, we call it a *retroflexion*. We distinguish three degrees of both conditions: the first, in which the fundus is below the promontory, but still higher than the external os; the second, where both are on the same level; and the third, where the fundus is lower than the external os, and the uterus rests ultimately on its fundus. Retroversion of the gravid uterus may pass into retroflexion in the course of pregnancy, merely because the fundus cannot rise past the promontory. In the majority of cases a gradual replacement of the retroflexed uterus takes place spontaneously toward the end of the third month, so that it regains its normal position. Merriman, Oldham, and Stillé, however, claim to have observed cases in which the uterus remained retroflexed until near term. If the obstruction be very considerable, the anterior wall of the organ, in the pelvic inlet, may ultimately project and grow upward, so that a partial retroflexion remains. Cases of this kind have been described by Merriman, Graves, Hecker, Ramsbothan, Michaelis, Franke, Jackson, Wyse and G. Veit. The uterus is then shaped like a cystocele, or the uterus introrsum arcuatus, or like a figure 8, the depression being found exactly at the promontory. The posterior wall has already been strongly forced into the hollow of the sacrum before the anterior wall is put upon the stretch. The larger portion of the child remains in the upper anterior, and the child's head in the lower posterior diverticulum (Oldham's observation). These are the dangerous cases which may be confounded with post-uterine hæmatocele, or impacted ovarian tumors, or with subperitoneal myomata. If the traction become greater, the portion of the uterus which is above the pelvic brim may draw up the expanded anterior wall which, as the child's body glides into it, will pull the other parts after it and thus produce a spontaneous reposition before the end of pregnancy. The illustration of this condition in Parvin's work (l. c., p. 269), after Depaul, is certainly as inaccurate as the drawing of the pelvis, in which the course of the vertebræ from the fourth lumbar to the coccyx is represented almost as a straight line, although the cut is said to have been drawn from nature (?). The condition of partial retroflexion may, however, persist until the end of pregnancy, as in the above-mentioned case of Oldham, correctly depicted in Veit's paper (l. c., p. 1359). On the other hand, the portion of the uterus which is in the pelvis may develop downward so that the perineum appears as a rounded projection (case of Eichhorn and Schatz). But the uterus may also advance in some other direction, either by pressing upon and perforating the wall of the rectum and then escaping through the anus (case of Halbertsma), or by opening the posterior vaginal wall and passing through the vulva (case of Greuser and Dubois); this condition is called prolapsus of the retroflexed gravid uterus.

Etiology.—In most cases of this displacement of the pregnant uterus, the disease existed before pregnancy, fecundation being favored by the lower and more accessible position of the cervix. But, in the narrowed and extremely deformed pelvis, retroversion, together with retroflexion, may also develop gradually, because the fundus meets with an obstruction below the promontory, or it may be forced down and backward by some severe muscular exertion, or by an over-distended bladder if there have been parametritis superior. The uterus may be also suddenly displaced backward by a force striking it from above and in front. A great many retro-displaced impregnated uteri regain their normal position in the course of the first two months, which fact is proved by the proportionately rare occurrence of this affection during pregnancy in comparison with the frequency of the displacement in unimpregnated females, and also by repeated personal observations.

There has been a long dispute as to whether a prolonged retention of urine is the cause or result of retroversion. Both parties are right. In the beginning, retention is undoubtedly a consequence of displacement; but—and this should be borne in mind in the beginning of displacement—when, owing to partial irregular retraction or relaxation and defective involution, the entire pelvic peritoneum has lost its tonicity in the puerperium, the uterus can no longer be elevated by the filling bladder, and remains below and is covered over by that distended viscus (*Ziegenspeck, Archiv f. Gynäk.*, xxxi, p. 50). Thus, retroversion and retroflexion gradually result from distention of the bladder. This condition, however, is more frequently associated with incarceration in one and the same woman (*Stillé*).

Symptoms.—Excepting pain in the back, and a feeling of weight, together with difficult defæcation, no special symptoms exist in the earlier months in retroversion and retroflexion; the first and most important (often the only) symptom is difficult micturition, which by the fourth month amounts almost to retention. Owing to the excessive distention of the bladder the abdomen enlarges up to the navel, and even to the epigastric region. Hurry (St. Bartholomew's Reports, vol. xix) asserted that the retroverted uterus occasioned no disturbance before the end of the third month, and that a retroversion after the fifth month was impossible. The second part of his assertion has been shown to be untenable by G. Veit's review of the recorded cases. Constipation is not constant. Varicosities of the legs, abdominal walls and labia exist in isolated cases.

If the retention of urine have continued for some time and the bladder become greatly distended, ischuria paradoxa may occur, *i. e.*, the urine will dribble away from time to time, until the resistance of the sphincter again becomes so strong that the expansion of the bladder cannot overcome it. When decomposition of the urine has given rise to catarrhal inflammation of the urethra and bladder, large and small flakes (Comp. *Neue Zeitschrift f. Geburtskunde*, XXIX, p. 225–230) are formed on the inner surface of the latter, and a diphtheritis of the mucous membrane of the bladder ensues. Portions or even the entire mucosa are cast off, together with a part of the muscular tissues (case of Schatz). These fragments may be discharged in the urine, and are generally incrusted with uric acid. Even the entire mucosa of the bladder-wall, together with part of the peritoneum, may be thrown off in shreds. Such cases have been reported by Frankenhäuser and Madurowicz, in which portions of the bladder were inverted before they were cast off. Over-distention, as well as retroversion and retroflexion of the gravid uterus, have sometimes caused rupture of the bladder. The cases of Gualth. van Doevern (1765) and Lynn (1767) are the oldest on record which were confirmed by a post-mortem. In several other cases cited (*i. e.*, by Ed. Martin) as instances of rupture of the bladder, as well as those of Reinick, William Hunter and Wall, there was only great retention of urine in connection with the usual anomaly of position of the pregnant uterus. In a case published by me ("Berichte," II, p. 76), in which a nearly moribund gravida with retroflexion was admitted to the Dresden Maternity Hospital, and died in a few hours, although the uterus was easily reposited, the bladder was distended to the size of a child's head; its walls were in some places very thin and in others rather thick; it was filled with turbid, offensive urine. The vessels were strongly injected, and at the fundus was a space about the size of the palm of the hand containing a group of different sized erosions, and this area was covered with a thick, creamy fluid of an ammoniacal odor. This was the condition in the cadaver, though the bladder had been emptied by the catheter during life. It is evident that if labor or the desire for stool had compelled this patient to strain while the bladder was overfilled, these thinned portions with defective walls might have yielded, by reason of the thickened condition of the remaining part of the wall and the firm compression of the neck of the bladder against the symphysis, and thus a rupture of the organ might have taken place. Krukenberg has proved, in his interesting paper, based on recorded observations, that where catheterization of the bladder and reposition of the uterus were effected before the sixth day, no destruction of all the layers of the bladder has been found;

that no rupture of the bladder is to be apprehended before the tenth day if the organ be regularly emptied by the catheter; but that if the urine be retained longer, either result may be expected, rupture being more frequent. Krukenberg has been able to add to the above-mentioned two cases by van Doevern and Lynn, reports of one case each by Hunter (1771), Naumburg (1796), Saxtorph (1803), Moreau (1838) and Southey (1871), in which the bladder was actually ruptured; other cases were published by E. Schwarz (1880, *Centralblatt für Gynäkologie*, No. 6), and Krukenberg (1882). Rupture of the bladder during labor has been mentioned, but no case of this kind is known to me. Contusions and lacerations are not ruptures; and the former lesions are almost the only ones to be met with during labor. Still, rupture of the bladder through straining is certainly possible when the organ is diseased and distended, as will be seen by reference to my case, as before noted.

Anatomical Appearances.—In the case of Doevern the bladder was found ruptured and the abdomen filled with urine. The bladder was distended above the navel and hung in the belly like a fluctuating membrane. Lynn found nine or ten pints of urine in the abdomen; the bladder was ruptured near its base, hung loosely in the abdomen, and the region around the wound was gangrenous. Naumburg found an abscess with an internal fistulous opening in the anterior, and a small, round perforation in the posterior wall of the bladder. Saxtorph found a break in the posterior bladder wall. In Moreau's case the bladder was adherent to the omentum, and was perforated at a gangrenous spot. In Southey's case the organ had two gangrenous perforations, the lower one opening into the vagina near the neck of the bladder, and the upper into a cavity behind that viscus and above the uterus, bounded by extensive adhesions between the fundus vesicæ, uterus, cæcum, small intestine and the sigmoid flexure. The patient of E. Schwarz had five litres of brownish-red fluid in the abdomen; at the posterior vesical wall was a fissure, 3 cm. long, whose inner aperture was as large as a dollar. Hunter's case was similar. In Krukenberg's case, finally, the lower abdominal walls were connected with the anterior surface of the bladder by means of adhesions filtrated with pus. The lower coils of the jejunum and the upper coils of the ileum were lying at the pelvic inlet. On trying to remove them, it was found that two of these coils, together with the mesentery uniting them, completely covered a defect of the bladder the size of a small saucer, and were firmly united to its edges. In this case, however, eleven days after the reposition of the incarcerated pregnant uterus, a gangrenous membrane, 2–2.5 mm. thick, weighing 115 gm., and 370 mm. long, was expelled, on which the inner surface of the bladder and the peritoneum were discernible. On the former were found, besides detritus and amorphous masses, uric acid crystals and ammonio-magnesian phosphates directly overlying the muscular structure. The rupture may occur, however, not only in the posterior wall covered by peritoneum, but also in the anterior. At the point of rupture are found soft or firm lymph exudations, fusing the bladder to neighboring organs, and shutting off the flow of urine. The fact that the laceration is generally found on the posterior wall near the vertex of the bladder is accounted for by the relative thinness of this portion. The direction of the rupture was found to be oblique or transverse, the aperture being larger in the peritoneal covering than in the mucosa and muscularis; the length of the fissure was generally 2½–5 cm., the peritoneal edges were sharp, the muscular coats ragged and ecchymosed; the mucous membrane was usually surrounded by a low, red wall, due to an effusion into the submucosa. In one case, where rupture of the anterior wall was followed by an escape of urine, the tissues were infiltrated up to the navel, where the urine had penetrated the peritoneum. In spite of all these severe lesions of the bladder, the retroflexed uterus often appears quite intact in its walls as well as in its surroundings; the surface being free from deposits and adhesions, and its walls not markedly swollen, infiltrated, or even interspersed with hemorrhages. This is shown in a preparation in my collection, also in my case of retroversion ("Berichte," II, p. 75), in which peritonitis with gangrene was the cause of death. There were no anomalies on the uterus, which was low in the small pelvis, except some cord-like adhesions to the neighboring organs; the vagina, however, was covered with numerous ulcers. A rupture of the bladder, associated with the escape of urine into the surrounding parts, is soon followed by the severest symptoms of collapse, great pain in the hypogastric region is experienced, and sometimes a sense of tearing or bursting (Lynn's case); then violent desire to micturate without the ability to pass water sets in, and there is great anxiety, tympanites, nausea and vomiting. If a rupture of the bladder occur after adhesions to the intestines have formed, vesico-intestinal fistulas will result. Even if the affection of the bladder be not very extensive at the time, cystitis with retention of urine may lead to inflammation and dilatation of the ureters and the pelves of the kidneys, to hydronephrosis and pyelo-nephritis, with uræmia. Great compression of the pelvic organs and the rectum will be followed by tympanites, symptoms of intussusception, stercoraceous vomiting, and, finally, peritonitis, sudden collapse, and death.

The terminations of retro-displacement of the pregnant uterus may, therefore, be: *1st.* Spontaneous reduction with or without subsequent abortion (E. Martin performed reposition 38 times successfully, but abortion occurred subsequently in 9 cases). *2d.* Cystitis and abortion. *3d.* Death (Skinner: 14 of 63 = 23.8 per cent.). (*a*) by perforation of the posterior vaginal wall and prolapse of the uterus (cases of Greuser and Dubois) or of the rectum (*Halbertsma*); (*b*) by uræmia; (*c*) by rupture of the bladder (gangrene).

Diagnosis.—When an otherwise healthy woman who has missed two menstrual periods, consults us on account of ischuria, we must first ascertain the causes of the retention of urine, and on examination we shall soon discover a compression of the urethra and the neck of the bladder. We must next determine the position of the portio vaginalis and external os in the lateral or knee-chest position, in which retroversion and retroflexion can be best distinguished. The former of these states having been discovered, we must first empty the bladder by means of a thick male catheter. In retroversion the os uteri points forward and is behind or even above the symphysis. A downward direction of the orifice, a vertical position of the portio vaginalis, an inequality in the anterior and posterior fornices, an elongation and thickening of the posterior cervical lip indicate, however, a retroflexion. The impossibility to feel the uterus above the symphysis in spite of the high position of the os behind that bone, and the existence of every probable sign of pregnancy indicate a retro-displacement of the pregnant uterus. But we should not omit to try all the probable signs: to examine with finger, stethoscope and speculum, and to inspect and palpate the breasts. Among the numerous mistakes that have been made, we may mention, confounding retroversion with retro-uterine hæmatocele, in which the portio vaginalis is likewise anteposed, but by careful palpation the fundus can always be felt above the symphysis. Urinary troubles are not constant. The tumor, in case of hæmatocele, generally arises suddenly, in connection with menstruation; there is usually, also, some loss of blood. The vulva, the vagina, even the cervix are pale, not hyperæmic; the os is not altered.

The symptoms of an acute hemorrhage into the pelvis as the result of a rupture of a *tubal pregnancy* are different. Here the sudden symptoms of considerable internal bleeding coexist with all the probable signs of gravidity; hence, the differential diagnosis is not particularly difficult. A combination of retro-uterine hæmatocele with intra-uterine pregnancy may occur; I have observed one case myself. Here the uterus, enlarged and pushed forward and upward, can easily be isolated from the tumor filling Douglas' pouch; the sudden appearance of the latter can be established from the history.

Ovarian tumors, incarcerated behind the uterus, are uneven, tense and elastic; the fundus can be felt; the tumor, even if rather large, lies laterally; the cervix is harder in unimpregnated females; in short, the probable signs of gravidity are wanting.

Myomata of the posterior uterine wall are much firmer than the gravid uterus; hemorrhage is usually present with them, and often is quite profuse; the vaginal cervix is likewise harder; the fundus can be felt under the abdominal wall.

Parametric exudations arise chiefly from septic infection during labor, and from gonorrhœal infection; the history, the examination of the discharges, the density and uneven contour of the tumor readily distinguish it from a retro-displacement of the pregnant uterus.

In retroflexion of the gravid uterus, the anterior vaginal wall extends almost vertically upward and behind the symphysis; so does the urethra; these facts must be borne in mind when the catheter is used, and if, after its introduction, no urine passes, we must not overlook the fact that its escape may be prevented by detached pieces of the mucous membrane obstructing the eye of the catheter, or the point of the latter may pass between loosened portions of the wall and the muscular structures (*Valenta, Schatz*). If the diagnosis, nevertheless, appears uncertain, a renewed examination during complete anæsthesia is to be made (also per rectum), by which means the connection of the tumor with the cervix can be ascertained, and one or both ovaries may be distinctly felt. Besides, the softer consistence and the form of the swelling will, in most cases, permit the differentiation of the roundish, evenly distended, elastic uterus from other tumors.

The prognosis is decidedly bad, in untreated cases, and wherever symptoms of incarceration appear. Under timely treatment, however, most of the cases run a favorable course. They are only fatal in the severe forms of disease of the bladder, and where peritonitis has already set in. Reposition is much more difficult in cases where the retroversion or flexion is of long standing. A return of the trouble has been observed by E. Martin in 25 per cent. of the cases.

Treatment.—If backward displacement existed before gravidity, or if the pelvis is narrow, regular and easy defecation must be carefully maintained. The dorsal position and great exertions should be avoided; the urine must be voided regularly, if necessary by the catheter.

Should retroversion occur despite these precautions, and spontaneous reposition fail to take place, *manual reposition* becomes indispensable. This is done, after emptying the bladder, in the knee-chest or the lateral position, with either hand, through the vagina or the rectum. As a rule, the vagina, being wider and more yielding, is to be preferred. The manipulations necessary about the anus often cause fissures, and its narrow opening hinders the operator, and sometimes, indeed, requires incision. In the lateral position chloroform may be employed. The whole or half the hand is used for reposition; the body of the uterus is not pushed or crowded suddenly upward, but very gently guided laterally past the promontory; when it has been brought above the pelvic brim, the cervix is led backward and downward to its normal position. The patient must maintain the abdominal or lateral decubitus; the urine must be drawn by the catheter several times daily, and an enema be given once a day.

If reposition does not succeed at once, we should wait, administer some mild antipyretic *p. r. n.*, and try again after awhile, in the mean time placing a colpeurynter in the vagina or the rectum, because reposition of the uterus has often taken place spontaneously by its pressure (*Hurry*).

After reposition, a lever-pessary must be worn to the fifth month of pregnancy to prevent recurrence. But if the displacement cannot be rectified, and symptoms of threatened incarceration appear, the induction of abortion is absolutely indicated. This may be done by introducing a sound (*Kiwisch*), or catheter (*Ramsbothan*), or a laminaria tent into the cervix, provided the os is accessible. When this is not the case and the os can only be reached with great difficulty, the cervix may be drawn down, during narcosis, with a tenaculum, and the membranes may then be ruptured with the sound.

Aspiration of the bladder has also been used as a remedy, when catheterization was impossible, and reposition of the uterus accomplished subsequently. A trocar and canula should be inserted about 8 cm. above the symphysis, and a stilet must be at hand to clear the latter. Puncture of the bladder is not entirely free from danger, owing to a possible infiltration of urine, but it has been successfully performed, even without interrupting pregnancy, by Münchmeyer, Cheston and Kilian.

In the worst cases of retroversion *puncture of the uterus* is indicated, thus diminishing its size by letting off the liquor amnii.

Hunter recommended it in incarcerated retroversion of the gravid uterus; Jouel, of Rouen, performed it first in 1811, passing the trocar from the vagina. Viricel, of Lyons, in 1813, punctured through the rectum. In Viricel's case, the escape of half a pint of clear liquor amnii gave relief, and the tympanites subsided; strong labor pains set in on the fifth day; in two or three hours a dead fœtus (four to five months old) was expelled; the uterus resumed its normal position and the patient left the Hospital after a month in perfect health. (*Trautmann*: "De la retroversion uterine pendant une grossesse." Strasbourg, 1851, p. 42.)

As a rule, abortion follows the aspiration in a short time. The operation must, of course, be undertaken with antiseptic precautions; a speculum is first introduced into the rectum or vagina, and the place selected for the puncture is carefully washed with a sublimate solution. If, in spite of these precautions, the result of the operation is bad, we must not be surprised, because puncture is only performed as a last resort in irreducible incarceration. Owing to a diagnostic mistake in a partial retroflexion, a pregnant uterus was punctured by two physicians in Saxony. The case resulted fatally and the operators were prosecuted. I succeeded in obtaining their acquittal by proving that three professors of gynæcology in Paris had, at the same time, committed the same diagnostic error, and had performed the same operation with equally unfortunate results. The cases of W. Hunter, Cranninkx, Martin, Delaharpe, Viricel, Brynham and Schatz have proved that aspiration of the uterus is not dangerous, even if the placenta be perforated. Hurry cured 32 cases of posterior displacement of the pregnant uterus by using the colpeurynter in the rectum. Of 15 cases, 5 aborted (4 spontaneously and 1 after passing the sound), 1 patient died of protracted retention of urine.

If partial retroflexion of the gravid uterus exists, direct reposition of the uterine segment in the pelvis is sometimes successfully performed through Douglas' cul-de-sac (*Hecker*), or by combined external and internal manipulation (*G. Veit*), or by pressure externally upon the head of the child, and internally upon the pelvic tumor (*Greaves*), or by hooking a finger into the child's anus and drawing down of a foot (*Oldham*), or, finally, by turning and extraction. If in partial retroversion the child's head could be reached through the vagina, we might endeavor to draw down the cervical lips by hooking the fingers into the os (*Michaelis, Oldham*), or by tenacula or ligatures.

The after-treatment should consist of rest, regulation of the functions of the body; if necessary, the application of an ice-bladder to the abdomen, catheterization, douches, diet and use of antipyretics. The chief indication in the after-treatment depends upon the conditions of the bladder: irrigation with salicylic solution (1 : 2000) should be done with great care; possibly drainage of the bladder might be recommended. In gangrene of the bladder, laparotomy might (indeed should) be thought of, if perforation into the abdomen threaten or have occurred. Thus we could remove the diseased parts and suture the bladder.

CHAPTER IV.

Ante-displacement of the Uterus and Pendulous Abdomen. (Anteversio et Anteflexio uteri gravidi. Venter propendens.)

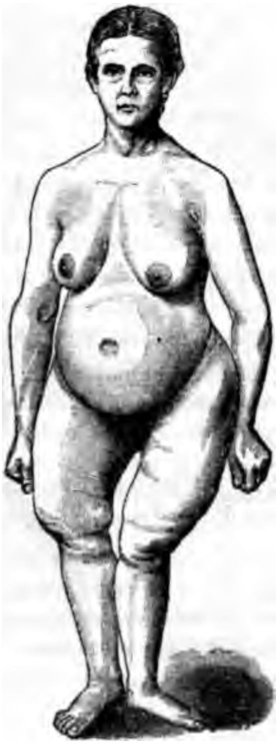
LITERATURE.

Ahlfeld: *Archiv f. Gynäk.*, XIII, 161, 1878. Charles, N.: "Vomissements incoërcibles à six semaines de grossesse, anteversion de l'utèrus, réduction de l'organe, cautérisation et dilatation du col suivies de guérison, fausse couche survenue deux mois plus tard." *Journ. d'accouch.* de Liége, 1882, III, 266–268. Elischer: *Centralbl. f. Gynäk.*, Leipzig, 1886, X, 165. Gehrung; *Americ. J. Obstetr.*, N. Y., 1882, July. Hueter, V.: *Monatsschrift f. Geburtsk.*, XXII, 113. De Voe, A.: "Remarks on the significance of anteflexions in pregnancy." *Am. J. Obst.*, N. Y., 1884, XVII, 838–841.

Anteversion and anteflexion of the pregnant uterus may occur in any month of gestation. In the first months the uterus is still in the small pelvis, its fundus resting against the symphysis, the cervix is directed backward, and the organ is abnormally fixed in front or behind; in the second half of gestation the fundus uteri hangs down over the symphysis and forms, in simple cases, an obtuse angle with the anterior wall of the pelvis (Fig. 47); in severer degrees the fundus may form a right and even an acute angle, so that the anterior wall rests upon the thighs of the patient when sitting. The fundus is then inverted, being directed nearly straight downward. The os uteri is correspondingly drawn farther backward and upward, even above the brim of the pelvis, and the anterior wall of the uterus is frequently expanded in the shape of a bag. The relaxed condition of the abdominal walls is generally associated with marked separation of the recti, and a thinning of the fascia and skin. If the fundus uteri and the portio vaginalis are about on the same level, the navel may form the most prominent point, and the whole abdomen appear pointed ("pointed belly"). The distance of the xiphoid cartilage from the navel is generally very much increased in cases of pendulous abdomen.

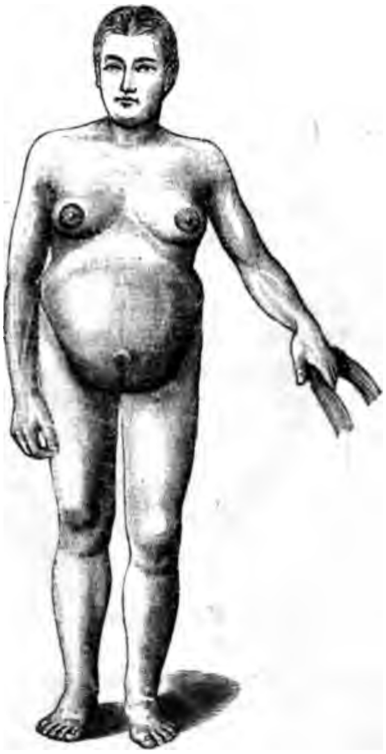
The *symptoms* resulting from this displacement during the first month are dysuria, strangury, and, according to the statements of Hueter, Ahlfeld, Gehrung and de Voe, also nausea, vomiting, fainting, hemorrhage and abortion; constipation is frequent. Ahlfeld is of the opinion that anterior displacement, where the uterus is impacted and the pelvis is wide, may result in an incarceration, or rather reversal of the uterus, with congestion and hemorrhage. Gehrung and de Voe think that anteflexion

FIG. 47.



Narrow pelvis, pendulous abdomen of the first degree; great prominence between navel and symphysis.

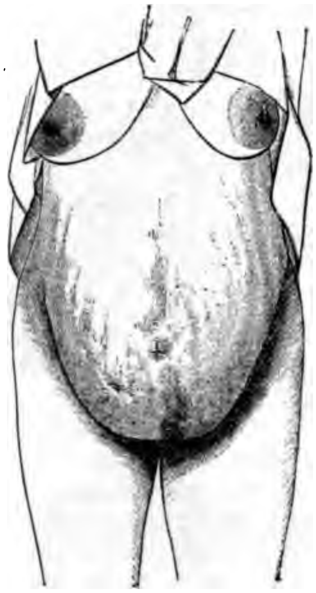
FIG. 48.



Occipito-posterior position with pendulous abdomen of second degree. Forceps. Marked stretching of abdominal walls between navel and symphysis, and navel and epigastrium.

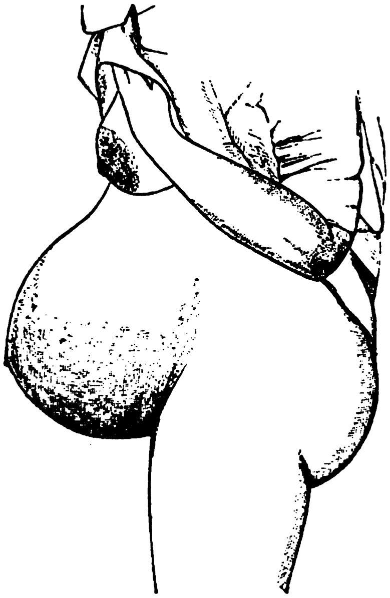
of the pregnant uterus is more frequent than is generally supposed. I have, however, never observed such a case. Subsequently walking becomes difficult, and pains are felt in the back, owing to the stretching of the abdominal walls and uterine ligaments; often intertrigo develops in the folds of the thigh and the lower portion of the abdomen, and incontinence of urine is sometimes present. Graily Hewitt looked upon anteversion as an important cause of severe vomiting (?). The results as to the child are faulty position or presentation or attitude because the lower part of the uterus is not fixed in the small pelvis. The presenting part of the child usually descends very late in pregnancy. During labor a faulty shape of the presenting membranes, premature escape of the waters, anomalous labor pains, at times contusion of the uterus, and a faulty engagement of the presenting part (Fig. 48), are frequent consequences of this uterine displacement.

FIG. 49.



Pendulous abdomen of the third degree in a gravida. Tenth month.

FIG. 50.



Pointed abdomen in a gravida. Tenth month.

Etiology.—An enlarged, thick-walled uterus, together with a narrow pelvis, with shortened transverse diameter and elongated conjugate, predispose (according to Ahlfeld) to anteversion and anteflexion. Relaxed abdominal walls and a narrow pelvis are the most common causes late in pregnancy; hence the affection is more frequent in multiparæ than in primiparæ. It is also often met with in contracted pelves, since the uterus with the child cannot enter so deeply into the pelvis, and, lacking its pelvic support, is directed toward the abdominal wall; moreover, the latter is stretched much more than is the case with a normal pelvis, it being impossible for the uterus to make use of the space in the small pelvis. The condition is likewise found in scoliotic persons, because here the uterus, even though the pelvis be wide, has not sufficient room between the diaphragm and the floor of the pelvis, owing to the shortening of the vertical diameter of the abdomen and the frequent lordosis of the lumbar vertebra; hence it is more and more pressed against the abdominal wall. A marked forward inclination (or tilting) of the pelvis would, on the other hand, only increase any existing predisposition when the abdominal walls are relaxed.

Treatment.—In the commencement of pregnancy reposition is said to be necessary (*Hueter*). I have stated that I never observed such a case, and I believe that incarceration must be rare in this displacement. Parvin, too, thinks that incarceration of the uterus in this displacement is scarcely possible. The cervix can be easily drawn down with a tenaculum, and retention in a proper position should be secured by a ring pessary.

In the second half of pregnancy it suffices to apply a tight abdominal supporter, which should be retained in position during labor until the child is born. A half-sitting position is to be assumed by the parturient, who should take to her bed early, lest the waters escape while she is standing and one or more of the extremities of the child be swept down.

CHAPTER V.

Hernia of the Pregnant Uterus. Hernia Uteri Gravidi. Hysterocele.

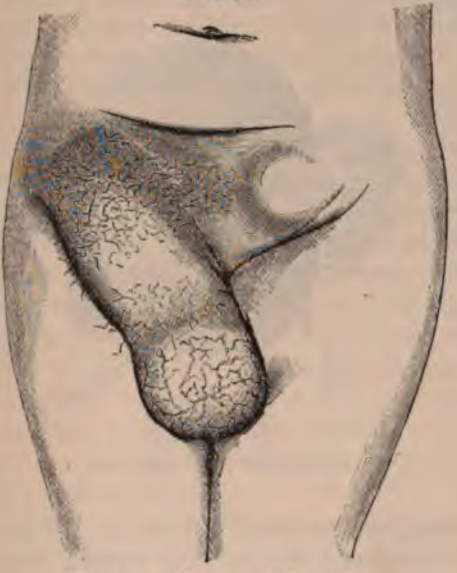
LITERATURE.

Eisenhart, H.: "Ein Fall von hernia inguinalis cornu dextri uteri bicornis gravidi." I.-D., Leipzig, 1885. A. Th. Engelhardt. Mit vier Abbildungen.

The uterus, whether impregnated or not, may enter a hernial sac, or, while in a hernial sac, it may become impregnated and develop in this position. There are now seven cases of this kind on record: the first is described by Nicolaus Pol (1531), the second by Sennert (1610), the remainder by Saxtorph (1775), Lédésma (1840), Rektorzik (1860), Scanzoni (1869), and the author (1884), (Figs. 51–53). All these cases have been collated and critically examined in the above-mentioned dissertation of Dr. Eisenhart, my pupil. They are all cases of hysterocele inguinalis. The case described by Skrivan and Lumpe was proved to be an extra-uterine pregnancy by a commission.

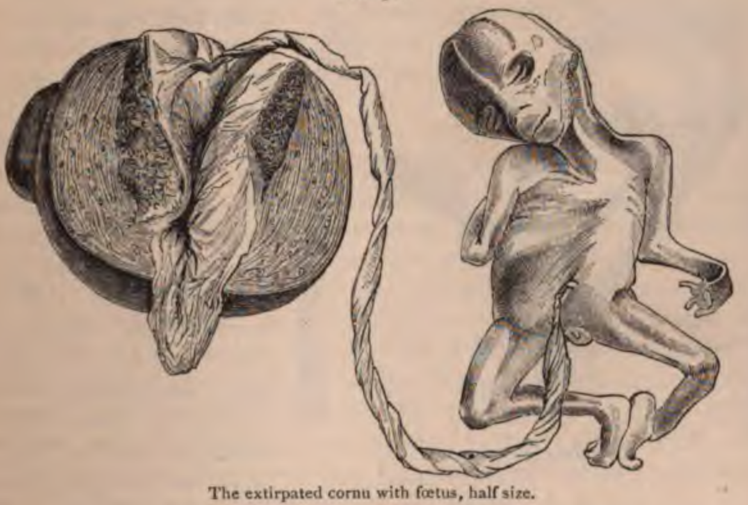
Etiology.—Inguinal hysterocele may arise from traction of pre-existing peritoneal adhesions (case of Chopart), or by the ovaries and tubes first passing into the hernial sac and becoming adherent there. As the latter enlarges, it does so at the expense of the peritoneal folds, which

FIG. 51.



Hernia cornu dextri gravidi inguinalis.

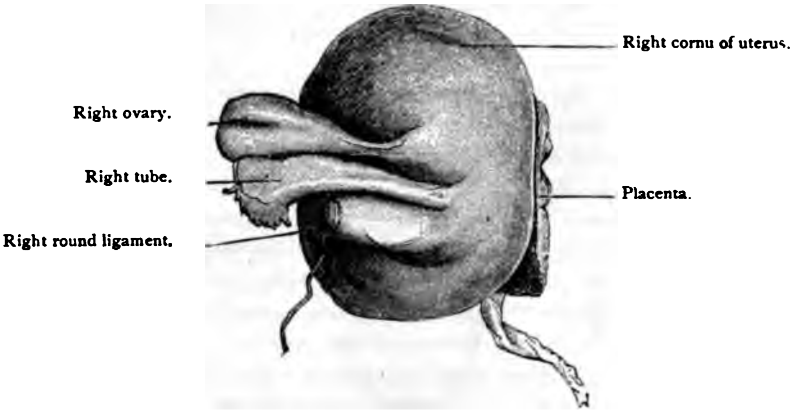
FIG. 52.



The extirpated cornu with fœtus, half size.

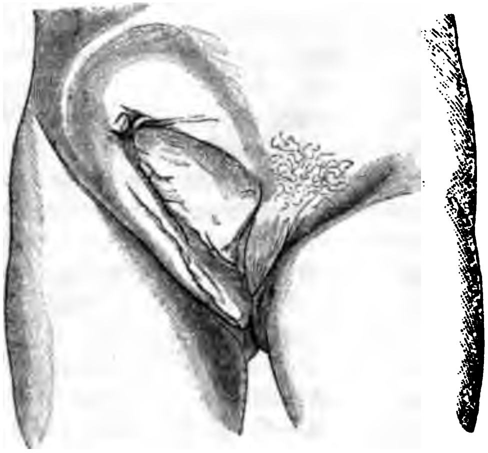
constitute the broad ligament, and the uterus is thereby brought into the hernial ring, and gradually passes into the inguinal canal (Klob: cases of Lallement, Olshausen, Scanzoni). There is also a congenital form of inguinal hernia of the uterus or of a uterus bicornis or unicornis—developmental anomalies which are comparatively frequent in hysterocele inguinalis. If the ovary descends along the round ligament as does its analogue, the testicle, along the gubernaculum Hunteri, and if, as in the male fœtus, even a short processus vaginalis peritonæi (or peritoneal pouch) is developed in the inguinal canal, then the ovary, though it has not yet passed through the inguinal canal, is disposed to enter the inguinal hernia when it develops later on, and the uterus or the corresponding uterine horn follows the shortened round ligament (*B. S. Schultze*). (Cases of Maret, Leopold, Rektorzik, Winckel.)

FIG. 53.



Extirpated part of the right cornu.

FIG. 54.



The Patient after Recovery.

Predisposing causes are, pre-existing herniæ (cases of Döhring, Lédésma and mine), frequent labors (in Saxtorph's case, 4; Rektorzik's, 5; Lédésma's, 6; Winckel's, 8; Döhring's, 9); also a great inclination of the pelvis and pendulous abdomen.

Exciting causes are any severe and sudden accessions of intra-abdominal pressure. The larger the pregnant uterus, the wider the hernial ring becomes and the greater the force required to displace the former.

Diagnosis.—The pear-shaped form of the tumor hanging down over the thigh, the dragging of the cervix toward the hernia, the proof of the connection of the cervix with the tumor by manipulation and exploration per rectum, show that the tumor, visible at the abdomen and thigh, must be the uterus. The recognition of the ovary in the tumor is easy, and the discovery of fœtal parts in the tumor renders the diagnosis of pregnancy certain. This condition cannot be confounded with extra-uterine pregnancy, since the latter has not yet been demonstrated to exist in the inguinal canal. In the diagnosis of hysterocele inguinalis we must suspect the existence of a uterus bicornis, and try to prove it by an examination from the vagina and rectum. If a spindle-shaped body is felt in the small pelvis on the side opposite to the one which is impregnated, a cautious attempt may be made to sound this part. Thus, in my case, the diagnosis of uterus bicornis unicollis was established without question.

Prognosis.—Abortion and premature labor occurred spontaneously in two of these seven cases (*Scanzoni* and *Saxtorph*); in the other cases operative interference was requisite. The size and duration of the hernia, age of the patient and any special complications must be taken into account in forming a prognosis. It happened only in Olshausen's case that the displaced cornu of a uterus unicornis with a rudimentary secondary cornu returned spontaneously from the hernial sac into the abdomen.

Treatment.—Reposition of the displaced pregnant uterus did not succeed in the cases thus far reported. Still it should be attempted, under profound narcosis. In the case of a small uterus at the commencement of pregnancy the induction of abortion by the sound is indicated, and has been performed with success in Scanzoni's case; in our case, however, the evacuation of the liquor amnii was of no avail, because the pregnancy had advanced too far and the fœtal parts could no longer pass through the inguinal canal. Cæsarean section is indicated where the fœtus is completely (or almost fully) developed; of four patients thus operated upon, three died (cases of Pol, Sennert and Rektorzik), probably because it was before the introduction of antisepsis; one recovered (Lédésma, the child died), the three children born alive throve for 1½ years, and longer. In inguinal hernia of a uterus bicornis the incarcerated cornu and fœtus must be removed according to Porro's method (as done by Rektorzik and myself).

CHAPTER VI.

Pregnancy Complicated by Ovarian Tumor.

LITERATURE.

Ashton: "Vortrag in d. Münchener Gynäkol. Gesellschaft 1887." *Münch. med. Wochenschrift.* Coles, W.: "A large fibro-cyst of the uterus and ovarian cystoma coexisting with pregnancy; operation, recovery." St. Louis, 1882, 16 pp., 8vo. Lomer, R.: *Archiv für Gynäkologie*, XIX, 301–320. Mundé, P. F.: "Three cases of pregnancy complicated by ovarian tumors; operation, recovery." *New York Med. Journal*, 1887. Remy: "De la grossesse compliquée de kyste ovarique." Paris, 1886, Baillière, 240 pp. Rendus, J.: "Kyste du Ligament large ayant occassionné des troubles pendant la grossesse." Mém. et compt. rend. Soc. d. sc. méd. de Lyon (1881) 1882, XXI, pt. 2, p. 30.

Ovarian tumors may prevent conception in different ways; the cases, however, are not rare in which impregnation has occurred despite the presence of bilateral tumors. Conception having taken place, the existing tumor may either grow, remain stationary or diminish. The first is the most frequent, the last the most rare occurrence. In my last case, a multilocular, glandular cystoma grew in pregnancy within six months, so that the circumference of the abdomen measured 1½ m., and the tumor contained 42 litres of fluid; in spite of this the uterus and fœtus grew under and behind the tumor, and the movements of the child were distinctly felt during the ovariotomy. The influence of the tumor on the progress of gestation differs according to its situation, its connection with the uterus and its size. If, for example, the tumor rests flatly against the uterus and has become adherent to it, the neck of the pregnant uterus must (as observed by myself in one case), protrude through the vulva, since it can grow no longer upward. If the long pedicle of a movable tumor is compressed and twisted, profuse hemorrhage into the cyst, its rupture and diffuse peritonitis may follow. If further expansion of the uterus be prevented by the size of the tumor, abortion ensues (in 15 per cent of these patients). Even before this occurs, the extreme degree of expansion and tension of the abdomen give rise to œdema, varicosities, constipation, urinary troubles, inability to walk, intertrigo, and other disturbances.

The *diagnosis* is difficult only in the highest degrees of distention, when one tumor cannot be mapped out from the other, and when auscultation is impossible on account of the backward displacement of the uterus. The tumor may also be above, alongside of or below the pregnant uterus; under these circumstances it is easily outlined by being separated from the uterine wall, and may be recognized by its fluctuation, its many prominences, the attachment of its pedicle, and the enlargement of the uterus; moreover, if situated below the uterus in the small pelvis, it would effectually obstruct delivery; finally, by twisting of the pedicle, hemorrhage into the sac may occur. In difficult cases, examination per rectum under an anæsthetic may be tried.

Treatment.—Ovariotomy during gestation is not more dangerous than when performed on non-pregnant persons. Merriman is said to have performed it first (1817); and Marion Sims to have performed it first successfully during gestation; both did so without having diagnosticated pregnancy (*Parvin*). In operations during the first four months, the mortality of the mothers is given at 11.3 per cent.; that of the children at 42.8 per cent.; during the last five months at 16.6 per cent. and 50 per cent. respectively. Under the expectant treatment, however, it amounted to 39.2 and 67 per cent. Schroeder has operated fifteen times, the author four times, and always with success. In 64 per cent. of these patients pregnancy goes to term. If the tumor is situated in the small pelvis, reposition per vaginam or rectum may be performed. Formerly, premature labor was induced (eleven cases; three mothers died; five children were born alive). But there is no indication for this method, in my opinion; for, if the tumor be in the pelvis and hard, such treatment is of no benefit; if it be fluctuating, tapping alone, or combined with reposition, is indicated; if it be above the pelvis, there is no reason for interrupting pregnancy, but an indication to remove the growth. If the cystoma is very greatly distended, ovariotomy may be preceded by tapping, which otherwise is only indicated where the graver operation is refused and the tumor in the pelvis cannot be reposited, or in the event of threatened abortion. As to the disturbances of labor caused by ovarian tumors, see Pathology of Labor.

SECTION II.

Diseases of Pregnancy Outside of the Genital Organs.

CHAPTER I.

Salivation.

LITERATURE.

Davezac: "Un cas de sialorrhée dans la grossesse; injections de nitrate de pilocarpine; guérison." Mém. et bull. soc. de méd. Bordeaux (1882), 1883, 280–284. Schramm, J.: *Centralbl. f. Gynäk.*, 1886, p. 507. Richardson: *Boston Med. Journ.*, 1887, July 12th.

Salivation is, on the whole, but rarely observed; it is mostly associated with extreme nausea and vomiting, and may be so severe that about one quart of saliva flows off daily (*Davezac*). Spiegelberg's opinion, that the secretion does not differ from the normal except in the quantity of water, has not been sustained by Fleck (comp. *Schramm*), who found in it an absence of ptyalin and a considerable diminution of sodium salts. In the majority of cases swelling of the submaxillary and sublingual glands, and also pain on swallowing are present. The saliva is very thin, and the mucous membrane of the mouth usually healthy; sometimes a coated tongue and gastric catarrh coexist. Baudelocque (*Richardson*) observed salivation occurring in successive pregnancies. It disappeared almost immediately after labor.

Pyrosis, nausea and eructations are relieved by magnesia usta or the carbonate, calcium chloride, above all by bicarbonate of soda, a teaspoonful dissolved in warm water; seltzer water, soda water, in fact any carbonated water; small pieces of ice are also beneficial. For salivation copious rinsing of the mouth with potassium chlorate solution (5 : 150) or with sulphate of zinc solution (5 : 150) are to be recommended. Decoctions of oak bark or cinchona are also beneficial; but these remedies must often be changed, since one rarely suffices. Potassium iodide, atropine and duboisine failed in Schramm's hands, as did galvanization of the cervical sympathetic. In Baudelocque's case the patient used no remedy in her first pregnancy; in the second some measures were successfully employed, but she died the following day, of apoplexy.

Davezac injected pilocarpine (0.01) into the forearm; the symptoms first increased and then diminished; a second injection had the same effect, and was followed by complete recovery; labor at the eighth month. J. Schramm obtained some improvement, but no cure, from seven injections of pilocarpine; success was finally attained by potassium bromide, which has an inhibitory effect upon the origin of the facialis in the medulla oblongata, on the central tracts of that nerve connected with the brain, and upon the secretory fibres of the sympathetic.

CHAPTER II.

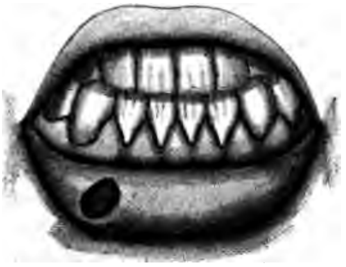
Inflammation of the Gums—Gingivitis.

LITERATURE.

Didsbury, Henry. "De l'état des gencives chez les femmes enceintes et de son traitement," Paris, 1883, 4to, No. 53. Pinard: "De la gingivite des femmes enceintes et de son traitement," 4th ed., Paris, 1886.

Gingivitis, which occurs not infrequently, is a very interesting though very unpleasant and disfiguring affection of pregnant women. The points of the gums between the teeth become broader, longer, and of a darker violet color, and cover the teeth as far as their free borders, resembling pointed condylomata (Fig. 55). The gums bleed readily, cause pain while eating, and emit a foul odor; but they decrease, as a rule, soon after delivery, though they may persist after childbed. Astringents, frequent rinsing of the mouth, removal of some portions, applications of the solid nitrate of silver may bring relief, but rarely cure.

FIG. 55.



Papilloma of lower lip, proliferation of the gums; natural size. 1887. G. J. No. 268.

CHAPTER III.

Parotitis.

Unilateral or bilateral parotitis occurs in pregnant women. I have observed a case in which first one and afterward the other parotid gland became affected and developed into an abscess without, however, interrupting pregnancy. The treatment is the same as in the non-pregnant woman: pressure, mild oleaginous applications, and potassium iodide ointment. When an abscess forms it must be opened early to prevent the pus from burrowing downward, and be treated strictly aseptically. Astringent mouth-washes will be useful, especially in preventing foul odor from the mouth.

CHAPTER IV.

Persistent Vomiting of Pregnant Women. (Hyperemesis Gravidarum.)

LITERATURE.

Monographs and Essays.—Charpentier: *Archiv. de tocol.*, Paris, 1885, XII, 498-518. Duncan, J. M. and A. Collins: *St. Barthol. Hosp. Reports*, London, 1883, XIX, 121–126. Hewitt: Tr. Obstetr. Soc., London, XXVI. Horwitz: *Zeitschrift f. Geburtsh. und Gynäk.*, 1883, IX, 110–190. Paczka, L.: *Pester méd.-chir. Presse*, 1884, XX, 786. Smith: *Amer. Journ. Obstetr.*, N. Y., 1886, XIX, 588, 624. Sutugin, Berlin, 1883, 8vo.

Causes.—Edis (Alcoholism): *Brit. Med. Journ.*, 1885, II, 697. Fischel, W.: *Prag. méd. Wochenschr.*, 1884, IX, 22, 29. Kelly: *Boston Med. and Surg. Journal*, 1886, CXIV, 337–341. Oliver, J.: "The Cause of Morning Sickness during Pregnancy." *Brit. M. Journ.*, London, 1887, II, 717.

Termination.—Glaser: "Bedeutg. d. Erbrech. Schwangerer." Erlangen (Jacob), 1885. Horrocks: "Death after Abortion." *Brit. Med. Journ.*, 1885, II, 13. Jenkins: "Abortion and Death." *Australas. M. Gaz.*, Sydney, 1885–86, V. 298. Sonrier: "Death." *Gaz. des hôpit.*, Paris, 1885, LVIII, 370–372. Stedman: 2 cases, 1 fatal. *Boston Med. and Surg. Journ.*, 1883, CIX, 529. Veatch: "Vomiting, Septicæmia and Death." *Peoria Med. Monthly*, 1884-85, V, 682–687.

Pathology.—Griswold: *Louisville Med. News*, 1883, XXI, 337–340.

Treatment.—Local to Uterus. Apperson: *Virginia Med. Monthly*, Richmond, 1881–84, X, 459-470. Chamberlain, W. M.: *Med. Rec.*, New York, 1884, XXVI, 664. Lewis: *Med. Rec.*, New York, 1887, XXXI, 454. Sutton: "Cauterization of the Cervix." *J. Amer. M. Ass.*, Chicago, 1886, VI, 499.

Induction of Labor.—Biechy: *Journ. Soc. de méd. et pharmac. de l'Isère*, Grenoble, 1883–84, VIII, 30–52. Doe: *Boston Med. and Surg. Journ.*, 1886, CXIV, 121-128; 132–135. Donzellini: *Ann. di ostetr.*, Milano, 1886, VIII, 29–36. Haviland: *Am. Journ. Obstetr.*, New York, 1883, XVI, 165. Jaffé, M.: Sammlung klin. Vorträge. März, 1888. Jordan: Tr. Med. Ass., Alabama, Montgomery, 1883, p. 61–76. Mennier: Abortus. *Union méd. Reims*, 1883, VIII, 14–20. Scott: Abortus. *St. Louis Cour. Med.*, 1884, XII, 61–67. Skirving: *Australas. M. Gaz.*, Sydney, 1883–84, III, 273. Wiedemann: *St. Petersb. med. Wochenschr.*, 1886, N. F., III, 395. Wright, W. T.: *Peoria M. Monthly*, 1883–84, IV, 6–14.

Potassium Bromide.—White: Trans. Texas Med. Ass., Austin, 1885, XVII, 351–362. Robins, R. P.: *Med. News*, Philadelphia, 1885, XLVI, 195.

Cerium Oxalate.—Tonoli, S.: *Gaz. méd. ital. lomb.*, Milano, 1885–88, VII, 288; 296.

Quinine.—Windelschmidt: *Allg. méd. Centralzeitung*, Berlin, 1884, LIII, 1233.

Chloral Hydrate.—Leon, F.: *Gac. méd. catal.*, Barcelona, 1885, VIIII, 741–743.

Cocaine.—Engelmann: *Centralbl. f. Gynäk.*, 1886, X, 396. Weiss: *Med.-chir. Centralbl.*, Wien, 1885, XX, 266–268 and *Prag med. Wochenschr.*, 1884, IX, 497.

Iodin.—Guéneau de Mussy: *Bull. et mém. Soc. de thérap.*, Paris, 1884, XVI, 63. Hart, D. B.: *Edinb. Clin. and Path. Journ.*, 1883–84, I, 419.

Tincture of Iodine.—Eliot: *Med. Record*, New York, 1887, XXXII, 422 (fatal).

Internally.—Pop-corn of Sweringen: *Obst. Gaz., Cincin.*, 1883, VI, 402. Wallace: *Med. and Surg. Reporter*, Philadelphia, 1883, XLVIII, 172.

Phosphorpeptone.—Judet: *Gaz. d. hôpit.*, Paris, 1884, LVII, 724.

Treatment by Electricity.—Kochmann: *Algem. med. Centralzeitung*, Berlin, 1883, LII, 409–411.

Mechanical Treatment.—Johnson: *Journ. Am. Med. Ass.*, Chicago, 1886, VI, 284–288; 304. *Washing Out of the Stomach.*—d'Ardenne: *Revue méd. de Toulouse*, 1884, XVIII, 385–399. *General Treatment.*—Clarke: *Journ. Am. Med. Ass.*, Chicago, 1885, IV, 572–585. Duncan, W.: "On a New Method of Treating the Vomiting of Pregnancy," *Lancet*, London, 1887, II, 754. Gillar: *Med.-chir. Centralbl.*, Wien, 1887, XXII, 493–495. Harkin: *Prov. M. J.*, Leicester, 1885, XXVIII, 540. Morival: Paris, 1884. Davy, 8vo. Schücking: *Centralbl. f. Gynäkol.*, 1885, IX, 178-180.

The vomiting which appears in the earlier months, in five per cent. of all cases, especially on rising in the morning and on an empty stomach, is of little consequence and generally disappears toward the middle of gestation, provided the appetite and nutrition remain in good condition. In two-thirds of all cases, however, vomiting occurs before the end of the third month (rarely in the second half of pregnancy) immediately after eating (first stage), so that the food is in part rejected and the stomach retains but little nourishment. In such cases we often find a desire for indigestible food, and also, in some instances, increased salivation. The patients emaciate rapidly. Then comes a period (second stage) in which vomiting occurs also between meals, and there is disgust and dread of food. Violent thirst is associated with this stage; a small quantity of concentrated urine is passed, which contains a large amount of albumin, the tongue becomes dry, the gums are red and bleed readily. If this vomiting lasts long, the patients may become greatly emaciated and bed-fast, but the pregnancy continues. The vomited matter consists mostly of a clear, glairy and tenacious mucus which emits a sour odor, and often contains fungi. In the third stage blood is mixed with the vomit, the patient is feverish and in great distress and exhales a peculiar odor; fainting, delirium, hallucinations, icterus, follow in succession, and death at last supervenes from exhaustion or complications. *The terminations of this disease* are: spontaneous recovery, abortion and recovery, abortion and death, or death before abortion. But even where the symptoms were of such a threatening nature that death seemed imminent, recovery sometimes occurred without abortion (*Parvin*, *Winckel*); the duration is usually two to three months. Of the 118 cases collected by Guéniot, 46 died.

Etiology.—The following causes of hyperemesis gravidarum have been established: *Diseases of the uterus:* changes of position, abnormal mobility of the organ, incarceration of the retroflexed uterus, inflammation and erosions of the lips of the cervix. Thus Graily Hewitt found among 28 cases, 27 with faulty position or form of the uterus, 12 cases of adhesions; with reference to the cervix, among 13 cases, 4 of abnormal rigidity. In his opinion, the success of Copeman's method (detachment of the cervical pole of the membranes) is a proof that compression of the nerves in the region of the internal os is the cause of vomiting. *Preëxisting diseases of the stomach and intestines*, as alcoholism intensified by errors of diet, round ulcer and carcinoma of the stomach may lead to vomiting; also, obstinate constipation (*Fischel*), acute yellow atrophy of the *liver* (*Duncan*). Diseases of the *kidneys* and the *heart* (Bright's disease of pregnancy, see above), are not infrequently a cause (*Brock*). Inflammatory diseases of the *brain* (tubercular meningitis) and cerebral tumors may also be causes; *anæmia*, *chlorosis*, *pernicious anæmia;* other acute diseases, as tuberculosis of the lungs, are more rarely demonstrable. In one of my cases of extra-uterine pregnancy, about ten days after the death of the fœtus, obtained by injection of morphine, a very violent vomiting set in, followed, finally, by severe hæmatemesis, though not the slightest pathological change was found in the stomach post mortem. And so in a good many cases it will probably be some reflex or rather unknown factor which is at fault, since we are ignorant of the cause which produces the reflex. According to Lebert and Rosenthal, general nervous exhaustion, and according to Barnes, an excess of nervous energy (?) are said to be causes which, of course, proves nothing (*Parvin*).

Prognosis is doubtful and very unfavorable in the third stage.

In the *treatment* of this disease, attention must first be directed to the causation: in uterine displacements, a correction of the position; in erosions, cauterization of the part with silver nitrate or with wood vinegar, chromic acid, or chloride of zinc will be indicated. Copeman recommended dilatation of the os with the finger and detachment of the membranes around the cervix, also scarification of the latter.

In kidney diseases, tannin, enemata, extr. rhei compositum with extr. colocynthidis should be used.

In gastric and intestinal affections, sinapisms should be applied to the pit of the stomach, also blisters or an ice-bladder; morphine (0.01) combined with atropine (0.001) hypodermatically; small pellets of ice internally; cerium oxalate or valerianate 0.2 pro die in two pills (recommended by Blondeau, 1884). Furthermore, warm poultices over the hepatic and gastric regions and, internally, Carlsbad water taken as hot as possible. I have obtained very good results from this treatment. Artificial nourishment per rectum: meat, pancreated and chopped (150 : 50), in 100 parts of water and with addition of port-wine as an enema. Tincture thebaica per rectum 10 15 20 drops. In brain affections, an ice-bladder to the head, also potassium bromide and warm baths with cold affusions are indicated. From the experience gained in the after-treatment of ovariotomy cases, it appears that absolute rest of the stomach is indicated in many cases; hence, neither liquid nor solid food nor ice is to be administered for several days. After four or five days a trial is made with liquids in small quanities; nutrition being maintained per rectum, a plan successfully employed by Campbell for forty-two days. Busey recommended enemata of beef-tea, potassium bromide, tincture of opium and brandy, for two days every four hours, then less frequently; peptonized milk, white of an egg and defibrinated blood have likewise been employed for enemata. Lusk advises that the quantity should not exceed 120–180 gms. Sometimes, however, diarrhœa occurs, or the rectum becomes so irritable that the treatment must be suspended. Otherwise, in all cases, whatever their cause, we might try the use of carbonated beverages, champagne, milk and cognac, the yelk of an egg, and other liquids in small quantities, repeatedly administered; tincture of nux vomica, 2–5 drops, 3–4 times daily (*Parvin*). Golceran successfully employed a spray of ether to the epigastrium. Cocaine, which has been recently recommended for sea-sickness, might be applied locally to the canal of the cervix (10-per-cent. solution) or given in doses of 0.05–0.15 internally, or in the form of wine of coca. Kohler has allayed the violent vomiting of a pregnant women by painting the pharynx with a 10-per-cent. solution of hydrochlorate of cocaine; chloral hydrate per rectum and chloroform 3.0–6.0 : 400.0 in emulsion may also be employed as anodynes. Premature labor has been induced, in the most intractable cases, where the child was viable, or abortion in earlier months; but no reliable or even advisable remedy has as yet been found. In several cases where I was consulted to confirm the necessity for inducing abortion, I decided in the negative, and the patients recovered; many of my colleagues who were on the point of inducing abortion, have had a similar experience. It is not rarely the case that, after inducing abortion, the patient succumbs before the fœtus is delivered or dies after the abortion (*Horrocks*, *Jenkins*, *Sourier*, *Jaffé*).

CHAPTER V.

Affections of the Liver.

LITERATURE.

Berline-Hering: "Contribution à l'étude de la lithiase biliaire dans ses rapports avec la grossesse et l'accouchement." Paris, 1883, 4to, No. 314. Chamberlain. "Supposed acute yellow atrophy of the liver, with pregnancy." *Am. J. Obst.*, New York, 1884, XVII, 856. Cyr: "Rapports des coliques hépatiques avec la grossesse." *Ann. de gynéc.*, Paris, 1883, XIX, 241-256. Landouzy: "Des indications thérap. dans la lithiase biliaire chez la femme gravide." *Rev. méd. franç. et étrangère.* Paris, 1884, II, 479-484. Lomer: "Ueber die Bedeutung des Icterus für Mutter und Kind." *Zeitschrift für Geburtsh. und Gynäk.*, 1886, XIII, 169-185. Nicolas, J.: "Note sur l'emploi des eaux minérales, etc., pendant la grossesse." *Union méd.*, Paris, 1884, 3 S., XXXVIII, 1024–1028. Queirel: (Icterus.) "Nouv. arch. d. obst. et de gynéc." Paris, 1887, II, 16–26.

Icterus gravidarum.—Jaundice is a rather rare disease in pregnancy. I have observed it only once, in the catarrhal form and of an aggravated type. The patient had a gastro-intestinal catarrh. The child presented by the fœtus was extracted on account of its life being jeopardized, and died during labor. The liquor amnii was distinctly yellow in color.

Acute icterus occurs during gestation from poisoning with phosphorus; in such cases the fœtus presented fatty degeneration of the liver, hyperæmia of the stomach, ecchymoses, and fatty degeneration of the cells of the peptic glands. Catarrhal jaundice in pregnancy is caused by the pressure of the gravid uterus or of the colon distended by fæcal masses, upon the liver, whereby the discharge of bile is impeded (*Frerichs*). Peter ascribed the jaundice in pregnancy to increased physiological hyperæmia of the liver. The child is sometimes born icteric; as a rule, however, it is free from jaundice, since the coloring matter of the bile passes through the placenta with difficulty [illegible]. Jaundice may persist after pregnancy and childbed, and lead, in time, to pernicious anæmia. The development of gall-stones in pregnancy is of somewhat frequent occurrence.

The severe form, *icterus gravis gravidarum*, is much more rare. Tarnier ascribed the severe icterus of pregnancy to a poisoning by biliary substances retained in the blood, owing to liver disease. Duncan gave its frequency at [illegible], Spaeth at 1 : 10,502 (which agrees with my experience); while [illegible] doubted whether any characteristic case of malignant icterus had ever been observed. Charpentier collected 68 cases; 42 of these were prematurely confined (30 deaths and 12 recoveries), the remaining 26 were delivered at term. Among 143 cases of acute yellow atrophy of the liver, in [illegible] practice, 30 were pregnant. It is now pretty well established that this disease is due to a blood poisoning by schizomycetes. Virchow formerly considered the disease to be a uræmia caused by acute parenchymatous hepatitis. In most cases, however, the malignant icterus of pregnancy is merely the consequence of an acute septic infection. (I observed [illegible] case of this kind, published by my assistant, Dr. Wyder, [illegible], p. 247.) During pregnancy, the circulation in the abdominal organs is sometimes disturbed to such an extent that any slight cause may produce the group of symptoms of icterus gravis. It is, therefore, of relatively greater frequency during gestation. Frerichs found 31 cases of icterus gravis; of these 22 occurred in women, 11 of whom were pregnant. After a stage of incubation lasting from three to five days, and [illegible] gastric and intestinal catarrh, the usual symptoms are: rigor, vomiting, pains in the head and back, slight icterus, fever, followed by com[illegible] [illegible] exanthem, albuminuria; labor is followed by [illegible], by the appearance of leucin and tyrosin in the urine, [illegible] delirium, hyperæsthesia, exquisite tenderness over the liver and abdomen, death ensuing shortly after delivery. In a few cases the disease progressed so rapidly that the woman died undelivered. There are found in the blood an enormous quantity of white blood-corpuscles, many of them disintegrated, and numerous round bacteria. The autopsy reveals acute yellow atrophy of the liver, and foci of septic infection in the liver and kidneys. There were also found, in our case, perivascular swellings in the muscular tissue of the left ventricle, together with syphilis in the child. Wyder believes in the presence of a specific micrococcus, because septic infection is so frequent, and yellow atrophy occurs so rarely in lying-in women. Lomer, on the other hand, is of the opinion that the retention of the biliary secretions is the chief cause of the disease (?), since it has been proven that, under certain circumstances, cirrhosis of the liver, chronic fatty liver, compression of the bile ducts by tumors, puerperal, relapsing, and typhoid fevers and phosphorus poisoning might lead to acute yellow atrophy of the liver; but, as typhoid, relapsing and puerperal fevers are produced by specific bacteria, they cannot be adduced in support of this theory.

Treatment.—In mild cases of icterus, warmth, warm baths and mild laxatives (magnesia, the bitter waters) are indicated; in the severe cases, the induction of abortion has been recommended (*Duncan*), but also urgently advised against (*Charpentier*). Quinine or antifebrin might be tried.

CHAPTER VI.

Typhoid Fever.

LITERATURE.

Brousse, A.: "Grossesse et fièvre typhoïde." *Gaz. hebdom. des. sc. med. de Montpellier*, 1885, VII, 253–255. Finger, O.: "Ueber den Abdominaltyphus in der Schwangerschaft." Halle a. S., 1886, 8vo (Kämmerer). Joske, A. S.: *Austral. M. J.*, Melbourne, 1887, N. S., IX, 322. Hirst: *Med. News*, Philadelphia, 1887, LI, 608. Martinet: "Fièvre typhoïde et grossesse." *Union méd.*, Paris, 1883, 3. S., XXXV, 590, 601, 645. Sacquin, Aug.: "De l'influence reciproque de la fièvre typhoïde et de la grossesse." Nancy, 1885, 4to, No. 205. "Typho-malarial Fever." Discussion. *Obst. Gaz.*, Cincin., 1884, VII, 77.

Typhoid fever seldom occurs in pregnancy. I have observed it only three times during gestation and once in the puerperium. Two of the pregnant women were confined prematurely; the one exhibited the roseola very distinctly and died on the seventh day of the puerperium; the other two recovered, one of them by crisis. The other patient was affected with typhoid about the seventh or eighth month, but went to term and had an easy delivery during convalescence; the child lived and was vigorous; placenta marginata; slight fever in puerperium; recovery. In the fourth case, the first increase of temperature appeared as late as the tenth or eleventh day of the puerperium, when the woman was on the point of leaving her bed.

Goldschmidt has collected the following statistics:—

RESULTS.	TYPHOID.	VARIOLA.	CHOLERA.
Death without abortion,	3.12 per cent.	2.74 per cent.	28.19 per cent.
" after "	27.50 "	27.67 "	26.95 "
Recovery without abortion,	25.00 "	50.27 "	20.72 "
" after "	44.38 "	19.32 "	24.12 "

Typhoid occurs more frequently in the earlier than in the later months of gestation, and causes interruption of pregnancy in more than half of the cases. The splenic tumor may, by bursting, cause sudden death in pregnancy, in labor, and in childbed.

Typhoid is, according to Baratte, almost always (?) followed by interruption of gestation: the child is usually still-born, or dies soon after delivery.

The *treatment* of typhoid in pregnancy is the same as in the non-pregnant state. There is no indication for inducing abortion or premature labor, since it is unnecessary in the milder cases, and occurs spontaneously in the severer ones. Tepid baths, packs, enemata and nourishing food are chiefly indicated, besides the internal use of antifebrin: 0.25–0.5 pro dosi.

CHAPTER VII.

Dermato-mycosis Furfuracea. Pityriasis Versicolor.

LITERATURE.

Thin, G. N. Y. *Med. Journal*, Aug., 1882. Weyl and Geber: "Handbuch der Hautkrankheiten von Ziemssen." 1884, II, 340.

The fungus microsporon furfur causing this affection was discovered by Eichstadt in 1842. The fungi may be directly transmitted, and are hence contagious. Thin has always failed in inoculating them; Köbner, on the other hand, succeeded. The conidia are round, smaller than red blood-corpuscles, with a brilliant, yellowish granular nucleus and a membrane of double contour. The mycelia surrounding them form non-branching filaments with septa. The contents are granular. The fungi are found in the upper layers of the epidermis, never on the face, neck or hands, rarely on the genitals. They form brownish spots which are somewhat itchy, and by coalescing form large areas on the breast, abdomen and back. After removing a piece of tar paper from a patient suffering from pityriasis, Mansurion found that the covered place was free from the disease, which he believed to be due to the fungi being killed by being deprived of air.

Inunctions of green soap, baths, painting the parts with tincture of white hellebore, washing with potash or alcohol, sulphite of sodium, chrysarobin ointment (10–20 per cent.), a 2-per-cent. ointment of salicylic acid or sublimate (1:1000), commonly afford speedy relief. Thymol (5 per cent.), acetic acid and tincture of iodine are also said to be useful.

CHAPTER VIII.

Acute Exanthemata.

(A) MEASLES.

LITERATURE.

Cathell, D. W.: "A case of pregnancy complicated with fibroids and measles." Tr. Med. and Chir. Fac. Maryland. Baltimore, 1886, 157. Klotz: *Archiv f. Gynäk.*, XXIX, 448, 1887. Macdonald, A.: "Note of a case of Measles complicating pregnancy and parturition." Tr. Edinb. Obstetr. Soc., 1884–85, X, 22–26.

According to Klotz's careful investigations, the contagium of measles passes from the mother to the fœtus in many, but not in all cases. The more severe the exanthem is the more certainly will premature labor take place, either shortly before, during, or after the appearance of the eruption. The cause of this frequent interruption of pregnancy is to be found in an endometritis exanthematica which, in a reflex way, leads rapidly to uterine contractions, and may continue as a chronic endometritis after the expulsion of the fœtus. The chronic endometritis is identical with the hyperplastic form, which is characterized by a tendency to hemorrhage and diminished secretion; it does not, however, prevent conception, although it leads sometimes to abortion and sometimes to placenta prævia. The occurrence of the latter is said to be explained by the uterine contractions present, which drive the ovum lower down.

(B) SCARLET FEVER. SCARLATINA.

LITERATURE.

Hervieux: "Maladies puerpérales." Leale, C. A.: "Scarlet fever in the fœtus in utero and in the mother at the ninth month of pregnancy." *Boston M. and S. J.*, 1884, CX, 445–448. Holsburg, D. B.: "Scarlatina in utero." *Cincin. Lancet-Clinic*, 1886, N. S., XVI, 576.

Scarlet fever occurs very rarely in pregnancy, so that many authors have erroneously regarded pregnant women to be exempt from this disease. As to so-called puerperal scarlet fever, I refer to the Pathology of Childbed. I have never observed a case of scarlatina in pregnancy. In a scarlet fever epidemic prevailing in Vienna in 1801, all the pregnant women attacked by it aborted, and the majority of them died. Thomas, too, demonstrated that the mortality of scarlet fever is greater in pregnant and parturient women. Observations of purpura hæmorrhagica were published by Phillips (*Brit. M. J.*, London, 1886, II, 920) and Gazzini (*Ann. di Obstetr.*, Milano, 1886, VIII, 485–490); the latter thought he had cured the patients by hypodermatic injections of citrate of iron.

(c) SMALL-POX. VARIOLA.

LITERATURE.

Goldschmidt: see page 258. Laurent: *Lyon Médic.*, No. 24, 1884. (Containing the recorded cases. Pastau: *Berliner klinische Wochenschrift*, 1864, p. 419.

The greatest number of cases of variola were probably observed by Pastau. Among his 19 cases, abortion occurred four times; four of these 19 died of the disease, three before labor.

During an epidemic of variola, abortions are frequent, even in healthy gravidæ. Pregnancy may go to term in a gravida affected with variola, but abortion or premature labor occurs commonly in hemorrhagic variola (58.7 per cent.). The child is born either free from any signs of the disease, or with pock-marks or pustules; the healthy child may also become affected with small-pox in the first eight or ten days. Besides a case in the Berlin gynecological clinic, Sedgwick has reported a case in which the fœtus in utero or immediately after delivery was attacked with small-pox, while the mother remained well. Of twins in utero only one may be attacked. According to the experiments of Gast and Behm, if a gravida is successfully vaccinated shortly before delivery, infection of the fœtus is an exception. Laurent observed the delivery of a macerated fœtus, 26 cm. long, weighing [illegible] gm., whose whole body was covered with pustules 2–3 mm. in diameter, the contents of which were of a light-brown color and sanguineous. The parturient was delivered on March 26th and had nursed, up to Feb. 28th, another child which died of small-pox. The mother remained well. A child in utero may be covered with vaccine pustules, though the mother remain healthy.

These experiences certainly do not justify the induction of premature labor, or even abortion. The treatment is the same as in non-pregnant cases: tepid baths, compresses, quinine, antifebrin, wine, etc. Pregnant women who have not been recently vaccinated should be vaccinated in small-pox epidemics ([illegible]).

CHAPTER IX.

Anæmia.

LITERATURE.

[illegible] [illegible] für die med. *Wissenschaften*, No. 4, 1883. Mori, G.: "Caso clinico di un anemia profonda complicata a gravidanza." *Ann. di obstetr.*, Milano [illegible] and 593.

An abnormal diminution of albumin and of the red corpuscles in the blood occurs frequently during pregnancy; hemorrhages, albuminuria, mal-nutrition and diarrhœas may change a simple hydræmia and chlorosis to that extreme degree which has been designated as pernicious anæmia. The causes of this condition, which Frankenhäuser ascribed to an invasion of the stomach and liver by fungi derived from carious teeth, have not been satisfactorily explained.

Symptoms.—Loss of appetite, increased weakness and frequent syncope, slight icterus and systolic cardiac murmur. The urine is free from albumin. Premature labor generally occurs in the eighth month and soon terminates fatally. The autopsy reveals a high grade of anæmia, hydræmia, fatty heart, and serous effusions. The examination of the blood shows a diminution of the red corpuscles, and, here and there, micrococci moving about rapidly.

The treatment should consist of a very liberal, nutritious diet with large quantities of the albuminate of iron, of baths and inunctions, also of massage and forced feeding. Warfringe recommended arsenic. Subcutaneous injections of blood into both thighs were recommended by Ziemssen and Liebermann. Petrone praises arsenic as an anti-parasitic. Mori claims to have cured two patients by hypodermatic injections of citrate of iron.

CHAPTER X.

Pulmonary Tuberculosis.

LITERATURE.

Chiara, D.: "Tuberculosis comune e granulosi acuta in gravidanza." *Ann. di obstetr.*, Milano, 1886, VIII, 491–500. Fiessinger: "De l'influence de la tuberculose sur la grossesse et le produit de la conception." *Rev. méd. de l'est*, Nancy, 1884, XVI, 336–342. Martel: "Grossesse et tuberculose." *Gaz. d. hôp.*, Paris, 1886, LIX, 51. Martin, J. W.: "Hæmoptysis in Pregnancy." *Med. Press and Circ.*, XLII, 328, London, 1886, No. 5. Martinetti, A.: "Minaccia di morte per accesso dispnoico in donna gravida tuberculosa." *Ann. di obstetr.*, Milano, 1886, VIII, 107–113. Opie: "Laryngeal Phthisis in Pregnancy with subsequent confinement." *New York Med. Journ.*, 1886, XLIII, 131. Peterson, F.: "Acute tuberclosis of meninges, lungs and kidneys in a seven months pregnant woman, etc." *Buffalo M. and S. J.*, 1883–84, XXIII, 158. Picot: "Tuberculose miliare aiguë avec localisation meningitique chez une femme enceinte, etc." *Gaz. hebdom. d. sc. méd. de Bordeaux*, 1885, VI, 484–487.

According to Austin Flint's investigations, 11.5 per cent. of women under 40 years of age, who suffer from phthisis, are said to have presented the first symptoms of the disease during pregnancy, and 13.5 per cent. soon after their delivery. According to Gaulard, the puerperal state and lactation are said to terminate the process in three-fourths of phthisical women (*Parvin*: "The Science and Art of Obstetrics," 1886, p. 225).

Tuberculosis may almost come to a standstill in pregnancy, so that patients who previously were suffering from excessive expectoration, improve. G. B. Wood even thought the disease was ameliorated by pregnancy and the puerperium. On the other hand, however, pregnancy may frequently lead to increased congestion of the lungs, to hæmoptysis and exhaustion from loss of fluids. Thus, I once observed a rapid exacerbation of tuberculosis without hæmoptysis, coincident with the beginning of pregnancy; shortly before death the woman was prematurely delivered, the child dying soon after. At another time, I heard of a woman who began spitting blood with the commencement of her third, fourth and fifth pregnancies (her mother had died of pulmonary tuberculosis), and who, from the beginning of her tenth pregnancy suffered from severe attacks of hæmoptysis; subsequently these became very frequent, and in the intervals there was free expectoration. It was impossible to doubt that the disease had advanced. Again, in other cases with an hereditary predisposition, the disease develops in the course of pregnancy, and this variety generally runs a very rapid and pernicious course. Premature labor not infrequently happens in these cases, though pregnancy may go to term. In some cases, phthisical patients succumb a few weeks, even a few days after confinement. The new-born children are mostly weakly and die early; less frequently they are fully developed and vigorous. According to F. Grisolle, Dubreuilh, Burgeois and Ortega, the rate of mortality in children born of phthisical women is 38 per cent.; about one-fourth (23 per cent.) of these children are still-born, the others die soon after birth (*Fliessinger*). We have cited, in the introduction to this section, Charrière's case (1873), in which the new-born child of a tuberculous mother was already tuberculous (as proven by the autopsy).

The act of parturition is dangerous where advanced tuberculosis exists; the loss of blood and the great muscular exertion are both very serious matters. Narcosis is, therefore, urgently indicated in the second stage of labor, as soon as all the conditions are favorable; also the artificial termination of labor. Tuberculous patients must not nurse their infants, since there is no doubt that the bacilli may be transmitted through the milk.

CHAPTER XI.

Cardiac Diseases in Pregnancy.

LITERATURE.

Ahlfeld: "Acutes Lungenödem bei bestehender Mitralstenose." "Ber. u. Arbeiten aus Marburg," iii, 83–86, Leipzig, 1887. Ashby, T. A.: "The influence of pregnancy and parturition upon organic cardiac disease." *Obstet. Gaz.*, Cincin., 1886, ix, 285–294. Bompiani: *Ann. di Obstetr.*, Milano, 1884, vi, 516–519. Bouquet-Lagrange, Paul: "Contribution à l'étude de l'influence réciproque de la grossesse et des maladies du cœur." Paris, 1885, 4to, No. 330. Jaccoud: "Des rapports des cardiopathies avec la grossesse." *France méd.*, Paris, 1887, ii, 1175–1178. Murdock, F. H.: "Habitual abortion in connection with disease of the heart and kidneys." *Med. Rec.*, N. Y., 1886, xxix, 390. Partridge, E. L.: "Pulmonary congestion and œdema from organic heart disease complicating pregnancy and labor." *Med. Rec.*, N. Y., 1882, xxii, 596. Senna, F.: "La gravidanza in rapporto colle cardiopatie organiche." *Gazz. d. osp.*, Milano, 1885, vi, 698–700, 708, 730, 754, 762, 770, 778. Stone, J. S.: "Case of albuminuria in pregnancy with dilatation of the heart followed by hemiplegia; use of veratrum viride; recovery." *Virginia M. Monthly*, Richmond, 1886–87, xiii, 27–30. Vjajlinski: "Basedow'sche Krankheit bei Schwangeren." *Ejened. klin. Gaz.*, St. Petersburg, 1885, v, 356–360. Wessner: *Centralbl. f. Gynäk.*, 1884, p. 390.

Heart diseases in pregnancy are not rare. The most frequent form is insufficiency of the mitral valve, next that of the tricuspid, together with aortic stenosis and insufficiency. The majority of my cases exhibited mitral insufficiency; Peter, too, found in his 14 cases only one of aortic insufficiency. The first symptoms make their appearance between the third and sixth month. Porak found 57 cases of insufficiency of the mitral valve, 22 cases of mitral and tricuspid, and 13 of aortic insufficiency. The latter author distinguishes four types: in the first, palpitation of the heart, dyspnœa, oppression, dizziness, headache, no pulmonary symptoms; in the second type (which is more frequent and often complicates the first), congestion of the lungs, œdema, hæmoptysis, apoplexy, infarction, epistaxis, hæmatemesis; in the third (that of asystole), œdema, ascites, hydrothorax, and associated kidney and liver diseases. Finally, in the fourth type, infarctions in the liver, kidneys, etc., appear. Mitral stenosis is said (according to Macdonald and Porak) to be more dangerous than mitral insufficiency. The tendency to abortion, partus immaturus and partus prematurus is considerable, but not quite so great as is sometimes stated; the average weight of the children does not of necessity remain below the normal; it amounted, in my 13 cases, to 3093 gms., and—although the placenta is often interspersed with hemorrhagic spots—on the whole, fœtal nutrition cannot be said to be disturbed. Too much blood is often lost in the third stage (600–1000 gms). It may be that my cases, the number of primiparæ being large, terminated more favorably than those of others, since it has been found (*Parvin*) that, though disturbances due to heart disease occur in the first pregnancy, they increase in frequency and severity from the second pregnancy on; this statement, however, is not confirmed by Wessner's cases, of which more hereafter.

As to the *etiology* of cardiac disease in pregnancy, it is stated by those who assume a physiological hypertrophy of the heart, that this hypertrophy may, like the uterus, undergo an imperfect involution and increase rapidly in a quickly recurring pregnancy. Hypertrophy of the left heart causes dilatation of the aorta and consequently valvular insufficiency. The heart being no longer able to perform the increased amount of work, and to overcome the great resistance, the above-described changes will appear. The danger of insufficiency is greatest in parturition, but in certain cases (two of which I shall narrate, the alarming symptoms occurred before, either in the form of the sudden development of pulmonary œdema (which is the more frequent symptom), or of *hemorrhages* into the lung tissue and hæmoptysis. There is no doubt that psychical affections are quite important in originating these conditions. I distinctly observed this in a case which well illustrated the dangers of the induction of labor.

I have observed during the past seven years, among 8000 labor cases, 22 cases of cardiac disease: 14 in primiparæ, 3 in IIpara, 2 in III and IVpara, 1 in an VIIIpara. Of these there were 14 normal labors = 63.6 per cent.; 5 premature, living children = 23.0 per cent.; 3 immature children = 13.4 per cent. Four labors required artificial aid; two the forceps, one (twins) external cephalic version, one the induction of premature labor owing to considerable narrowing of the pelvis. Of 23 children, 19, = 82.6 per cent., were born alive and discharged, 4 were still-born, having been either not viable or macerated. Of the mothers, 1 died during labor; premature labor had been induced near the end of her pregnancy on account of rachitic kypho-scoliosis, ascites and nephritis; the fœtus presented by the breech; although the living child was quickly extracted, the parturient died of pulmonary œdema. The autopsy showed hypertrophy of the right heart, and parenchymatous nephritis. The child survived.

The first case observed by myself, 26 years ago, terminated very unfavorably, there being mitral insufficiency and stenosis with great dyspnœa and cyanosis; the attending physician tried to induce labor, but could not pass the elastic catheter properly into the uterus. Rapid pulmonary œdema and death occurred while the parturient was in the lateral prone position. Cæsarean section was performed immediately, but did not save the child. I have also observed (in the wife of a colleague who had suffered for some time from heart disease) an acute endocarditis with pneumonia in her first pregnancy. I decided, nevertheless, against the induction of labor. The patient recovered and was delivered by the forceps of a child who, like the mother, is still living.

Treatment.—Pregnancy associated with cardiac disease should not be interrupted artificially, because we cannot guarantee success; moreover, because this proceeding entails injurious psychical excitement and local irritations, and particularly because it is not certain that the mother's suffering will be relieved by it. Wessner also, while denying the existence of a physiological cardiac hypertrophy and attributing the increase of the cardiac muscular tissue to the greater bulk of the body, says that the cause of the unfavorable influence of heart disease on pregnancy lies in the physical and psychical disturbances occurring during parturition, but that these causes are generally overestimated and that the prognosis is better than is generally stated. Of 25 women who were the subjects of heart disease and passed through 93 parturitions in the Berne maternity, only one died of insufficiency of the mitral valve with pneumonia. The child in this case was still-born. This agrees with my experience. The best treatment will, therefore, be symptomatic and consist in administering digitalis, strophantus, nitrate of potash, diuretics or diaphoretics, and in regulating the diet.

Cardiac diseases not only do not contra-indicate the use of anæsthetics during labor, but they are rather useful by diminishing any injurious efforts at straining and quieting the action of the heart and keeping it regular (*Macdonald*, *Vergely*, *Bar*). A sovereign remedy, not to be overlooked in such cases, is ether, which, when collapse or pulmonary œdema is impending, often saves the life of the patient; it should be injected in large quantities under the skin every ten or fifteen minutes.

CHAPTER XII.

Secondary Syphilis.

LITERATURE.

Atkinson, J. E.: "The causes of abortion and premature labor in syphilis." *Maryland M. J.* Balt., 1885, XIII, 421–423. Bossi, L. M.: "La Sifilide nella gravidanza." *Gazz. d. clin.*, Torino, 1886, XXIII, 129, 145, 161, 177. Galzain, Alfred: "Influence de la Syphilis sur le cours normal de la grossesse." Thèse de Strasbourg, 1864. Gascard, Arthur: "La syphilis placentaire." Paris, 1885, 4to, No. 308. Grellety: "Considérations sur la syphilis contractée pendant la grossesse." *Gaz. de gynéc.*, Paris, 1887, II, 163–168 and 177–179. Hirigoyen, L.: "Syphilis et grossesse." *Mém. et bull. Soc. de méd. et chir. de Bordeaux*, 1886, 335–361, 378. Neisser: *Breslauer ärzt. Zeitschrift*, No. 3, 1888, and *Internationale klin. Rundschau*, Wien, 1888, pp. 233–235. Vallois, Léon: "Syphilis chez la femme enceinte." Nancy, 1883, 4to, No. 176. Zilles, R.: "Mittheilungen aus der geburtshülfl. Klinik zu Tübingen." 1884–85, 1 Heft, 2, S. 1–143.

The commoner secondary syphilitic lesions occur on the vulva, perineum and portio vaginalis in the form of indurations and pustules, also as general diseases in the form of angina, roseola or psoriasis. Pregnant women are more liable to syphilitic infection than the non-pregnant. If a pregnant woman be infected at least four weeks before parturition, the fœtus may suffer and be born diseased; if the mother be infected later, it remains healthy (27 of 42; *Dumal, Galzaine*). If infection took place about the time of conception, the diseased fœtus generally dies in utero and abortion or premature labor will occur. Among 414 syphilitic pregnant women only 260, = 63 per cent., were delivered at full term. From the fourth month to the end of the second year of the disease the disposition to abort is most pronounced (*Fournier*). But if the poison be introduced into the system after the fourth month, the danger of the interruption of pregnancy is much less. Some authors believe that the disease may be transmitted from the fœtus to the mother (*Fournier*). The children, if born alive, are oftentimes poorly nourished, without any other demonstrable diseases (comp. Bärensprung: "Hereditary Syphilis," pp. 155–166). Syphilitic pemphigus, however, is more frequently found on the soles of the feet and the palms of the hands, and about as often we find œdema, anasarca, swelling of the epiphyses and diaphyses (*Wegner*), disease of the liver and ascites. We shall return to this subject hereafter, in connection with syphilitic disease of the umbilical cord and placenta. Many children, at first apparently healthy, sicken and die in the first year of their life.

Treatment.—Mercurial treatment of the gravida is strongly indicated, even if the father alone is syphilitic and the mother exhibits no symptoms (*Parvin*); but the treatment should be mild, lest abortion occur. Surprisingly rapid and reliable effects have been gained by injections of calomel (vapore parat.): 1.0 in 10.0 of olive oil, a syringe full of which (1 cc.) is injected; four to six injections at intervals of eight or ten days suffice. Mercurial plaster is to be used in the dry, papular syphilides and for ulcers with scanty secretion; chrysarobin is also useful. Mucous patches should be painted with sublimated tincture of benzoin (1 : 100). For ulcerous forms, oxy-iodate of bismuth is efficacious, and better than iodoform and iodol (*Neisser*). Link treated the syphilis of infants with *iodide of potassium*, given to the mother; iodide of sodium may also be added to the milk; both are well borne up to 6, 8, and 10 gm. per diem (*Neisser*). Mercury and iodine treatment may also be combined. Grandin praises the chloride of potassium recommended by Lampion, also *iron*.

CHAPTER XIII.

Affections of the Eyes.

LITERATURE.

Bowen: "Albuminuric neuro-retinitis in pregnancy." *Austral. M. J.*, Melbourne, 1883, N. S., V, 448. Fano: "Troubles de la vision ches le femmes enceintes." *J. d'ocul.*, Paris, 1883, XI, III. Loring, E. G.: "Premature delivery for the prevention of blindness." *New York M. J.*, 1883, XXXVII, 59–64. Loviot: "Énucléation de l'oeuil gauche chez une femme enceinte deux et demi environ; continuation de la grossesse." *Bull. et mém. Soc. d'obst. et gynéc. de Paris*, 1887, II, 87. Lutz, G.: "Augenerkrankungen während der Gravidität und im Puerp." I.-D. Mittheil. aus d. ophthalm. Klinik. Tübingen, 1884, II, 1–43. Métaxas, Thémist. G.: "Des troubles oculaires dans la grossesse et l'accouchement." Paris, 1882, 4to, No. 404. Moore, W. O.: "Retinitis albuminurica during pregnancy; premature labor with improvement of vision." *Planet*, New York, 1883, I, 62. Palmer, S. E.: "Albuminuric retinitis; induction of premature labor." Woman's Med. Coll., Penna., Philada., 1887, 36–43. Teillais: "De quelques hémorrhagies oculaires pendant la grossesse." *J. de méd. de l'ouest*, Nantes, 1886, XX, 158–163. Williams: *St. Louis Med. and Surg. J.*, 1887, LIII, 272.

Amaurosis with Bright's disease and eclampsia, also amblyopia, and especially *hemeralopia* (night blindness), have been frequently observed during pregnancy. They are probably caused by anæmia and impaired nutrition of the retina. As in hysterical amblyopia, hemiopia, and dyschromatopsia, in which the ophthalmoscopic examination is negative, the prognosis is good and the disease curable. The *amaurosis* which arises more or less suddenly with nephritis and eclampsia usually disappears in the puerperium within a few weeks (F. Weber: *Berl. klin. Wochenschrift*, 1878, Nr. 5), or sooner (comp. Angear: *Centralbl. f. Gynäk.*, 1880, p. 92), even in one day. In pernicious anæmia, retinal hemorrhage, amblyopia and amaurosis are liable to occur, especially after severe hemorrhages, though from three to fourteen days may intervene between the latter and the eye disease. Kuechbert and Neisser discovered on the conjunctiva a bacillus in swarms and chains in hemeralopia, but they could not prove it to be pathognomonic of this disease (*Bresl. Med. Zeitschrift*, No. 4, 1883).

Treatment.—Quiet, rest of the eyes, diet, roborants, and preparations of iron. In the cases of Angear, Moore, Palmer and others, artificial labor was successfully induced in severe amaurosis.

CHAPTER XIV.

Affections of the Nervous System.

LITERATURE.

Bartens: *Allg. Zeitschrift für Psychiatrie*, XL, 1883. Carlin, P. V.: "Insanity of pregnancy." *Denver M. Times*, 1883-84, III, 225-234. Cleland, W. L.: "Insanity during pregnancy." *Brit. Med. J.*, London, 1887, II, 179. Hayward, W. T.: *Australas. M. Gaz.*, Sidney, 1886-87, VI, 188. Hodgdon, R. L.: "A case of cerebral disease complicated with pregnancy." *Boston Med. and S. J.*, 1887, CXVI, 59. Peretti: *Archiv f. Psychiatrie*, XVI, 2, 1884.

Hysteria and Hystero-Epilepsy.—Horrocks, P.: "Hysterical pregnancy." *Guy's Hosp. Rep.*, London, 1883-84, XLII, 159-161. Leonard: "Hystero-epilepsie pendant la grossesse; hémiplégie et hemianesthésie générale et sensorielle; fausse epilepsie jacksonienne; ovaralgie; hypnotisme possible pendant la grossesse, impossible pendant l'accouchement; attaque d'hystérie et délire pendant la travail." *France méd.*, Paris, 1886, II, 1637, 1649. Leonard: "De l'hystérie pendant la grossesse et le travail." *Paris méd.*, 1887, XII, 205-213.

Catalepsy.—Van Schoot, H.: "Katalepsie bij eene zwangere en haar jonggeboren kind." *Nederl. Tijdschr. v. Geneesk.*, Amst., 1887, XXIII, 110-113.

Chorea.—Brouardel: "Traitement arsenical; guérison; chorée anterieure." *Paris méd.*, 1884, IX, 354. Churton: *Prov. M. J.*, Leicester, 1886, V, 290. Gayrard, H.: "Contribution à l'étude de la chorée des femmes enceintes." Paris, 1884, 4to, No. 356. Hervé, P.: "De la chorée pendant la grossesse." Paris, Le Mans, 1884, 4to, No. 216.

Disorders of the mind are of much rarer occurrence in pregnancy than in the puerperium and during lactation; of 465 cases observed during all these conditions the attack commenced during gestation in but 55. The causes are: Depression, melancholy from shame, dread of the consequences, grief about existing or apprehended deformity of the child, or its death, or on account of the sex (girl instead of boy). An hereditary taint has great influence; moral and physical causes hasten the outbreak. The disease may recur in successive pregnancies (in 7, even in 10—*Voisin*). Melancholia and mania are the most usual forms, the former being the most frequent; erotic conditions also occur. Melancholic conditions are, prognostically, better than the maniacal. According to Marce, of 19 cases, seven recovered after confinement, two during pregnancy, one grew worse during parturition and soon died; in nine the disease remained incurable. Peretti's experience with psychoses and the changes produced in them by ensuing pregnancy is less favorable. In 15 of his cases, the disease had existed in eight for six months, in three for one year, and in four for two years. Recovery followed in but two, improvement in three, dementia in nine, death in one. These cases show that recovery from an apparently curable psychosis is the exception when pregnancy supervenes during its course; that *gravidity exerts*, in the majority of cases, rather *an unfavorable influence upon insanity*. According to Barteno's experience, likewise, the prognosis is rendered worse by pregnancy. Of 12 patients only one recovered, two improved, one died, eight remained insane.

The *treatment* can only be symptomatic and expectant. The induction of abortion or premature labor could hardly be expected to improve the serious prognosis, since the aggravating factors for these psychoses are even more numerous in childbed (loss of fluids, hemorrhages, labor pains, excitement) than during gestation.

Epilepsy, according to recent investigations (*Unverricht*, Breslau, 1883), is due to *diseases* of the *cerebral cortex*, the ganglion cells of which become more and more excitable as the disease progresses and react more rapidly and intensely to slight irritations. It is not more frequent during pregnancy than at any other period. Swieten's case, however, is noteworthy for the fact that a woman had epileptic attacks whenever she was pregnant with a boy. At times epileptic attacks become less frequent during pregnancy than before; at other times they remain the same, and in a third series of cases they are more severe than before, resuming their former type and intensity after pregnancy. The energetic treatment by potassium bromide (15 : 175; a tablespoonful four times a day) which is generally used in epilepsy may be continued during pregnancy, since the patients bear this remedy as well as they do table salt and could not do without it. Only when the attacks occur less frequently should the remedy be given in smaller doses and at longer intervals.

Chorea met with during pregnancy usually existed previously, but it may originate early during gestation, which may be interrupted by it or go to term. Primiparæ are more liable to it than multiparæ. The disease has recurred in successive pregnancies. Its *causes* are to be looked for partly in hereditary predisposition, partly in severe psychical excitement, partly in changes in the blood, in deficient nutrition, and in local irritations in the region of the genitals. Stephan observed chorea gravidæ associated with hysteria: giddiness and tinnitus aurium were followed by unconsciousness; after awakening the left arm was paralyzed, ptosis of the right eye and slight twitchings in the distribution of the facial nerve while speaking were present; while the right arm hung loosely, the primipara made incoördinated swinging movements with it, alternating with a spreading of the fingers, supination and pronation. The ataxic movements, the affection of the right facial nerve and the tongue, which was thrust against the lower teeth, indicated chorea, the transition of these symptoms indicated hysteria. Psychical treatment, gymnastic exercises, regulation of the digestive functions and hydrotherapeutic measures effected a cure and, 26 days after the onset normal delivery ensued, without any disturbance. According to Fehling the chorea of pregnancy is particularly unfavorable, since he had 18 fatal cases among 68 (1874). Barnes found (up to 1868) only 56 cases complicating pregnancy.

Charpentier observed it twice among 1600 pregnant women. Spiegelberg found, among 84 cases, 24 terminating fatally by complications. I myself have observed but one case of chorea in pregnancy; a primipara, 25 years old, who was delivered of a fully developed child and recovered.

Treatment.—Bromine water, potassium bromide, opium, morphine hypodermatically, chloral hydrate per os and rectum, dilatation of the os uteri (*Wade*) have been successfully employed; in desperate cases, abortion, or premature labor has been induced.

SECTION III.

Anomalies and Diseases of the Fœtus in Pregnancy.

CHAPTER I.

Extra-uterine Pregnancy (Graviditas extrauterina).

LITERATURE.

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(2) *Tubo-Ovarian Pregnancy.*—Beaucamp: supra. Berry: *Lancet*, London, 1883, I, 496. Paltauf: *Archiv f. Gynäk.*, 1887, XXX, 456–469. 1 pl. Vulliet: supra.

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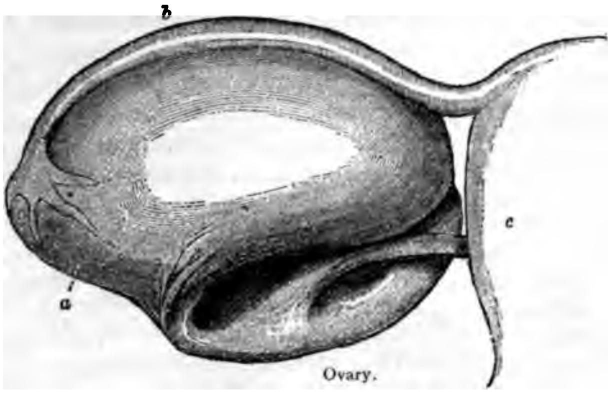
Definition.—Anatomy. Fecundation and attachment of the impregnated ovum may take place at any point where the ovum and spermatozoa may meet. Even when the ovum lodges outside of the uterus, the latter hypertrophies and a decidua develops within it, as in intra-uterine pregnancy. The cervical canal is closed by a plug of mucus. The other genitals also participate in the hypertrophy of pregnancy, especially the region where the ovum adheres and to which it sends its allantois for the formation of the placenta, whether this be at the ovary, in the tube, in the uterus, in Douglas' pouch or on the intestinal wall. The impregnated ovum, in its passage to the uterus, may be arrested anywhere, even at the ovary, and thus develop:—

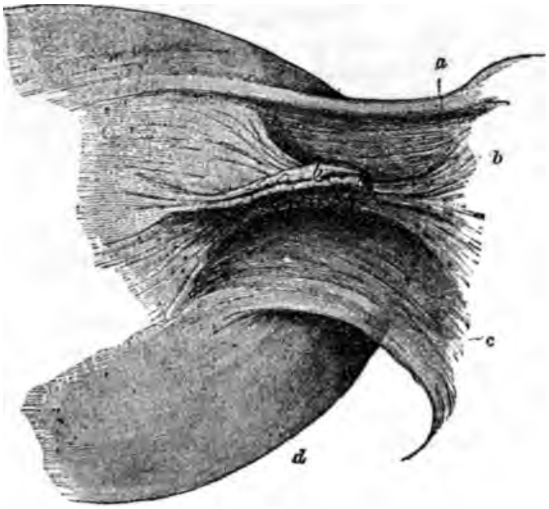
(*a*) *Ovarian pregnancy—graviditas ovarialis.* This may vary in certain respects. If the spermatozoa have fecundated the ovum while in the follicle of the ovary, then, with the closing of the follicle, a tumor of the ovary may arise in which the fœtus is completely surrounded by ovarian tissue. The

FIG. 56.



Left-sided ovarian pregnancy, in which only part of the ovary is included in the ovisac. *a*, Ovarian pregnancy; *b*, left tube; *c*, uterus (Obstetrical collection of the Munich Gynæcological Clinic, No. 332. Presented by Dr. Mayer, of Lindau; 1878).

FIG. 57.

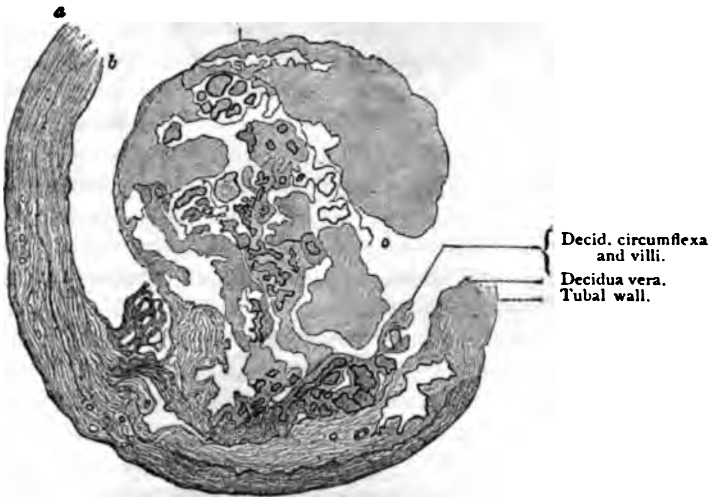


Left-sided tubal pregnancy in the outer third. *a*, Left tube; *b*, ovary; *c*, adhesion; *d*, ovarian pregnancy.

lacenta attaches itself to the wall of the follicle, and the decidua is replaced y the membrana granulosa, and the uterine wall by the ovarian stroma. The mor is connected with the uterus by the ligamentum ovarii (Fig. 56). e laceration of the follicle may, however, remain patulous or be re-opened by the rapidly developing, fecundated ovum. The latter will then protrude, and be enveloped by exudations from the peritoneum. This kind of gravidity is an ovario-abdominal pregnancy. It generally terminates in early rupture; while, if the follicle be closed, the ovum may develop to complete maturity. Müller and Widerstein have observed cases in which the ovarian pregnancy was extra-abdominal, *i. e.*, the impregnated ovum was found in an inguinal hernia.

(*b*) *Graviditas tubaria*, tubal pregnancy. It may be found in the outer end of the Fallopian tube (Fig. 57), also in the middle portion of the tube, and in the isthmus tubæ, that is, in that part of the tubal wall which lies in the uterine wall. In the first-mentioned locality, the ovum may protrude from the fimbriated end of the tube and thus give rise to a tubo-abdominal pregnancy. If the ovum remains in the free portion of the Fallopian tube, it constitutes simple tubal pregnancy; if it develops in the isthmus tubæ, it is called interstitial pregnancy. In tubal pregnancy, the tubal mucosa, like that of the uterus, develops into a decidua, and a decidua circumflexa may also be formed in the tube (as shown in a specimen presented by me in 1871 before the Society of German Naturalists and Physicians at Rostock). A similar case was recently demonstrated by Frommel, and again by myself (see Fig. 58). The fœtal envelopes in the various forms of tubal pregnancy are, therefore, from without inward: 1, peritoneum; 2, muscular layer of the tube; 3, tubal decidua vera; 4, tubal decidua circumflexa; 5, chorion; 6, amnion. Fig. 59 represents the case (diagnosticated by us twice) of a

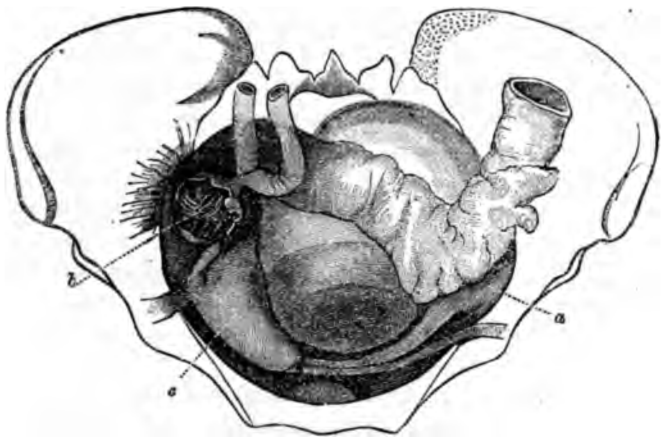
FIG. 58.



Graviditas tubaria ruptura finita. Decidua vera and circumflexa. *a*, Tubal wall; *b*, decidua; *c*, decidua circumflexa with torn chorionic villi and blood clots. (Presented by Dr. Gruber, Giesing.)

bilateral tubal pregnancy and the position of the neighboring organs, seen from the pelvic inlet. In any of these three forms, rupture may occur (according to Hun) in two to three months as a result of hyperæmia of the pelvic organs at the time of menstruation, and the fœtus escape into the peritoneal sac through the opening; the accompanying hemorrhage may or may not be fatal. Rupture between the layers of the broad ligament is of much rarer occurrence. Dezeimeris terms this condition *grossesse sousperitonéo-pelvienne.* To this class belong the cases of Nicolini (Pavia), and of Braithwaite (laparotomy, drainage, recovery; 1885). The distention of the tube does not always terminate in rupture; sometimes the fœtus dies, and the further changes it undergoes lead to encapsulation or suppuration. The fœtus may, however, reach maturity, as shown by a number of cases (Fabbri, Fränkel, Saxtorph, Schröder, Spiegelberg, Werth), and then die unless saved by laparo-salpingotomy. As in ectopic gestation in the outer third of the tube the pole or extremity of the ovum may project into the peritoneal cavity, so in the interstitial variety it may exceptionally happen that the ovum extends into the cavity of the uterus and is afterward expelled by the natural passages (recent case of Rathgeb: Inaug. Diss., Munich, 1884; with external transmigration of the ovum). Maschka's case is especially interesting in this respect: rupture of an interstitial tubal pregnancy was followed by the escape of the head of the fœtus into the abdomen, while the torn off trunk (whether artificially or spontaneously?) was expelled through the uterus. In this variety of tubal pregnancy, however, the ovum is, as a rule, shut off by adhesions both from the uterus and from the outer portion of the tube. Garrigues' assumption (see Literature, above) is, therefore, rather

FIG. 59.



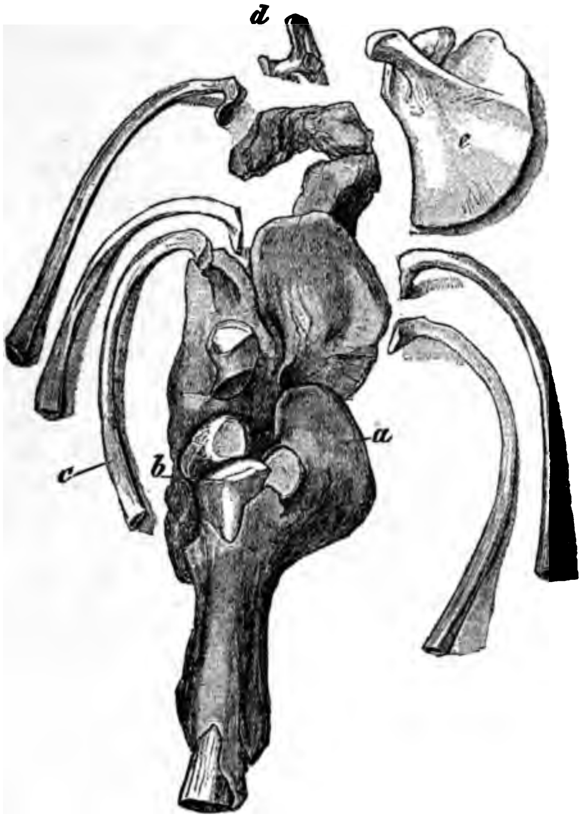
Bilateral tubal pregnancy. *a*, Left tubal pregnancy; *b*, right tube, opened, containing fœtal bones; *c*, uterus.

more than improbable. The point of insertion of the round ligament determines the variety of tubal pregnancy; for, in the interstitial form it is attached outside of the median line of the fœtal sac, but, in the tubal and tubo-abdominal forms, it is inserted toward the inside of the sac which occupies a lateral position. If a tubo-ovarian cyst existed before fecundation and if, is some manner, a follicle burst into the interior of this cyst, the ovum may become impregnated within it or in the tube and its wall be formed by the sac of the tubo-ovarian cyst. Even such a pregnancy may go to term, as demonstrated by cases of Beaucamp, Berry, Paltauf and Vulliet.

(*c*) *Abdominal pregnancy, Graviditas abdominalis*, arises when the impregnated ovum lodges in any part of the peritoneal cavity. It (the ovum) sinks generally behind the uterus into Douglas' cul-de-sac. Wherever it adheres the placenta is formed, either on the folds of the broad ligament, or on the posterior uterine wall, or on the venter of the ilium, or else on the intestinal wall. The peritoneum surrounds or envelops the fœtus on all sides; the walls of the ovisac are strengthened by fibrinous membranes to the thickness of 1–1.5 cm. The fœtus may attain maturity in this sac and even survive beyond term. In the wall of the ovisac muscular fibres were found by various authors; they were probably derived from the subperitoneal muscular tissue. Barbour found in the upper portions of the fœtal sac even striped longitudinal and transverse muscular fibres. Labor pains set in toward the normal end of gestation; the decidua is expelled from the uterus, unless this has occurred previously. During the pains the fœtal sac may rupture and discharge its contents into the abdominal cavity, or the placenta may be detached while the sac remains entire, and the hemorrhage into the latter may cause the death of the fœtus.

The dead fœtus may then become macerated and disintegrate, and sooner or later ulcerate into the rectum (Fig. 60), the bladder, the vagina, or through the anterior abdominal wall or through several organs at the same time, so that all the bones are expelled (case of Hayem and Giraudear: perforation occurred first into the rectum, then into the bladder, through which the entire skeleton of the five months' fœtus passed in the course of twelve months; recovery in two years. Fig. 60 shows a number of fœtal bones [(*a*) os ilium, (*b*) left femur, (*c*) ribs, (*d*) a fragment of a lumbar vertebra, (*e*) left scapula] which were discharged simultaneously through the rectum of one of my patients. She recovered. Not rarely, however, suppuration occurs, with fever, sloughing and pyæmia, or sudden death from peritonitis. Calcification of the fœtus ensues in some cases. The deposition of lime salts may be confined to the membranes, and be derived from the peritoneal adhesions. Küchenmeister calls this condition *lithokelyphos* (from κελυφος, eggshell). When some parts of the child become calcified together with the membranes, he terms the condition *lithokelyphopædion*. In such a calcareous envelope, even after absorption of the liquor amnii, the fœtus, being protected from all germs of putrefaction existing in the neighboring organs, retains its normal form and all its soft parts intact for decades; it may even look, when the calcareous sac is opened, as if it had died but a few hours before. In this connection Küchenmeister's case is very interesting, the child appearing quite fresh after having been carried in the calcareous sac for 35–40 years. In a case reported by J. Hofmeier, the seven-year-old

FIG. 60.



Fœtal bones passed per rectum. *a*, Left ilium; *b*, left femur; *c*, ribs; *d*, vertebral fragment; *e*, left scapula. Natural size.

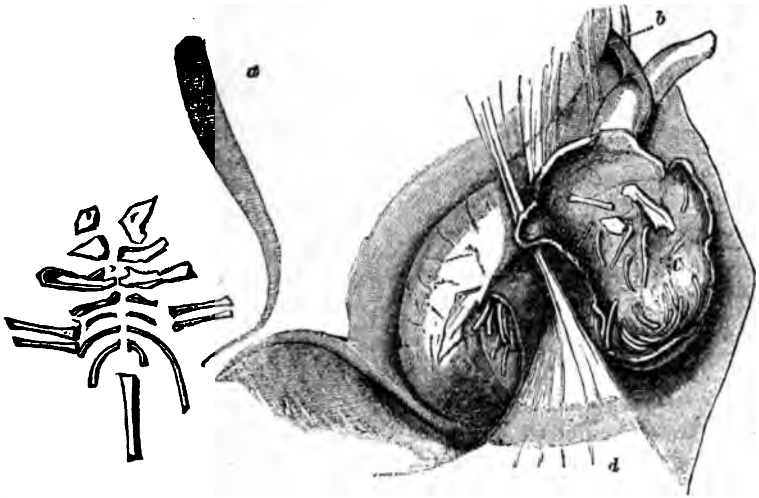
lithokelyphos (the mother having died of pyelonephritis) was found encapsulated in a sac, 3–5 mm. thick, in transverse position (head left dorso-anterior). All the organs, except the liver, spleen and a part of the small intestines (to which a necrotic process had extended from the vagina through the child's vertebral column), were in an excellent state of preservation, even the uterus and its appendages were as fresh as in a newborn child. The muscular structure of the upper arm proved, on microscopical examination, to be absolutely normal. Sappay found in a woman of 84 years a hard and uneven cyst in the right tube which she had carried for 56 years; it contained a fœtus of six or seven months which was entirely unchanged, looked perfectly fresh, and was normally formed. Sarrante found the muscles, connective tissue, elastic fibres, cartilage, bones, neurilemma, and perineurium well preserved in a calcified fœtus, while all the cellular elements had perished or atrophied. The preformed cavities in the bones and cartilages were impregnated with lime salts, the interstices of the glands and the subcutaneous cellular tissue were filled with fat crystals. The blood-corpuscles, the epithelia and endothelia were replaced by hæmatoidin or little masses of fat, which were likewise found in the liver together with biliary coloring matters. In other cases, the fœtus mummifies after the absorption of the liquor amnii; *calcification of its surface* starts from the vernix caseosa, the internal organs participating slightly if at all in the process. It is this condition alone which can be truly termed *lithopædion*.

The organs of the fœtus may also undergo fatty degeneration, and change into a lardaceous mass; the fat, by combining with the lime salts, becomes a kind of calcium soap; thereby it acquires, in part, a solid consistency; in part it appears coarsely granular, and incloses the disarticulated fœtal bones. Absorption of the soft parts of the fœtus and its fluids may also take place, the more or less coherent skeleton being left behind. Finally, the bones fall apart and become smaller and smaller by absorption (Fig. 61). The presence of a lithopædion may ultimately light up a fatal peritonitis. If the uterus does not take part in the formation of the ovisac, a new impregnation and nidation of the ovum in the proper place may ensue, so that an intra-uterine coexists with an extra-uterine gestation and goes to term (case of Caraman: excision of the extra-uterine fœtus in the seventh month; continuation of pregnancy up to term; the emaciated child died a few hours post-partum). Bozemann extracted an intra-uterine fœtus of seven months, and subsequently excised the extra-uterine fœtus of 3¼ years' standing through the posterior vaginal wall.

The forms of *primary* abdominal pregnancy are to be distinguished from the secondary, in which the ovum originally lodged in the ovary, tube, or in the wall of the uterus; but a rupture of the fœtal sac ensued, and the child escaped into the abdominal cavity, where it either continued to develop for some time, or died. The fœtus may be entirely free in the abdomen or become adherent to other organs, and be partly encapsulated. Here, too, lime salts may be derived from the peritoneum, and a lithopædion develop. An instance of this is afforded by K. Schroeder's case, in which the free head of the fœtus had become attached to the omentum only; over the face, feet and hands a deposit had formed like a veil, through which it could be seen that the thighs and legs had become adherent in the flexed position; it had been a primary tubal pregnancy which had ruptured. Leopold's case belongs also to this class: rupture of a left uterine cornu was succeeded by the escape of the child, which became encapsulated in the abdominal cavity.

Symptoms.—Soon after conception and the fixation of the ovum in a wrong location, all the uncertain symptoms of pregnancy appear in an aggravated degree; nausea, vomiting (sometimes uncontrollable), pain in the side, colic, rectal and vesical tenesmus, and depression. Annoying and very painful pressure makes walking difficult. Marked intestinal symptoms—mostly of a catarrhal, sometimes even of a dysenteric nature—are said to point to the implantation of the placenta upon the intestine (*W. A. Freund*). Wassiliew observed severe salivation, which continued until death, in a very remarkable case of abdominal pregnancy with peritonitis. These symptoms are associated with marked peritoneal irritation in the form of circumscribed acute peritonitis; hemorrhages from the uterus appear very frequently.

FIG. 61.

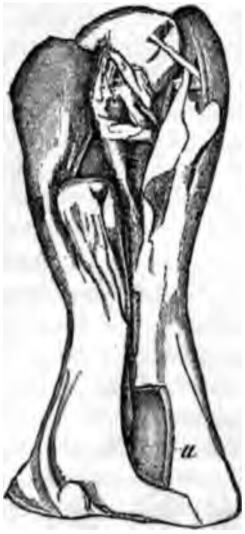


Fœtal bones from the right tube, removed by irrigation.

Right tubal pregnancy. *a*, uterus; *b*, extremity of tube; *c*, right tube, the size of a hen's egg, filled with fœtal bones; *d*, adhesions extending over the tube to the uterus. Natural size.

In all of my cases in which the time could be established with certainty, the decidua was expelled, either in fragments or entire, in the third to the fifth month. After intermittent attacks of violent colic, an intense pain sometimes occurs suddenly, with rapidly increasing collapse, and the signs of a severe hemorrhage in consequence of the rupture of the fœtal sac. The blood may flow into Douglas' pouch and over the venters of the ilia, along the vertebral column, and the patient may quickly succumb to the hemorrhage. But if the blood becomes encapsulated in the pelvis, *retro-uterine hæmatocele* is developed, with the absorption of which the pains diminish and recovery follows.

FIG. 62.



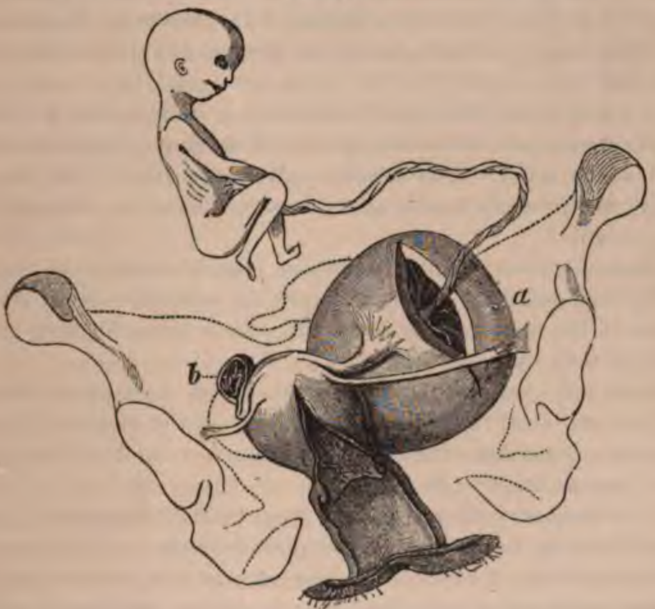
A decidua of pregnancy discharged during tubal gestation while the speculum was *in situ* for clinical examination; *a*, a piece excised for investigation.

When the pregnancy reaches the fifth month and the fœtus is still living, the movements of the latter are often unusually painful to the mother, causing her to scream out. The fœtus may (as above stated) attain full maturity, and even become uncommonly heavy. Chauvenet-Negri removed a fœtus weighing 3000 gm.; Howitz extracted one weighing 4200 gm. from the abdomen by laparotomy; the fœtus is sometimes deformed in the extremities or the trunk (*Mennen*).

The movements of the child finally cease; then appear symptoms of its death: depression, chills, disagreeable sweats, decrease in the size of the breasts, oozing of the milk, etc. The gravida may now improve, and completely recover if the ovum become calcified. The abdomen may diminish in size to such a degree that the woman may be suspected of having removed the fœtus clandestinely (example: case of König). On the other hand, chills and fever may reappear, tenesmus follow, and, sooner or later, a fœtal bone be passed per rectum, with violent pains; the other bones gradually follow, sometimes with great agony. The perforation of such fœtal bones through the bladder is the severest. This condition was formerly termed *vesical pregnancy*. A case described by Joseph is the most instructive; it shows how terrible the sufferings of such women can be. Relatively, the most favorable process is the formation of an abscess, the fœtal sac perforating through the abdominal walls (recent case of Bonzol, of Lyons, with subsequent gangrene and fistula of the intestine and spontaneous recovery), because this elimination of the fœtus may be readily discovered and the outlet suitably enlarged, so that the entire process may be much shortened and rendered less dangerous. But even in that event the women may succumb. *Intestinal occlusion* has sometimes occurred as a result of peritoneal adhesions in ectopic gestation. If small communications form between the intestines, stomach, vagina, and abdominal wall, fistulæ may remain for some time and greatly retard the elimination. In the case of Bonzol, cited above, a coil of intestine which had become incarcerated in a similar abdominal fistula became gangrenous. Anus præternaturalis ensued, which, however, closed spontaneously. On the other hand, when the opening was very wide, the escape of the contents of the bowels into the sac has given rise to rapid sloughing.

It is, furthermore, worthy of notice, that extra-uterine pregnancy *may recur repeatedly in the same woman* (case of Siegenbeck von Heukelom, of bilateral tubal pregnancy, also the case described by the author, Figs. 59 and 63). Twins have likewise been found extra-uterine, and the ectopic ovum may degenerate by myxoma of the chorion, and may also contain an excessive quantity of liquor amnii. Thus, Teuffel evacuated seven litres of fluid charged with striated muscular fibres from the macerated fœtus.

FIG. 63.



Fœtus killed both times by morphine. Length of fœtus, 17½ cm.; length to the anus, 12¾ cm.; length to the navel, 11 cm. *Skull Measurements:* antero-posterior diameter, 5 cm.; transverse, 3.3 and 2.8 cm.; small oblique, 4½ cm.; large oblique, 5½ cm.; circumference, 13.3 cm. Length of uterus, 10 cm. Decidua discharged in the third month. (*a*), left tubal sac with fœtus of four months. (*b*), right tube (been pregnant two years ago) with fœtal bones.

The *death* of the patient, therefore, is due either to hemorrhage, or to perforation into the peritoneum, or to pyæmia or exhaustion. If an intra-uterine pregnancy succeeds to an extra-uterine fœtus, the former may be arrested and interrupted by the latter (cases of Bozeman, Caraman, and others), but it may also go to full term; and the extra-uterine fœtus may then so obstruct delivery that Cæsarean section will become necessary (cases of Clarke, Rosshirt, Sale).

Etiology.—The origin of *ovarian pregnancy* may be explained either by assuming that the fissure in the follicle was too small—not so much so as to prevent the entrance of the semen, but to permit the egress of the ovum—or that a tubo-ovarian cyst was present, into the most dependent portion of which mature follicles are discharged (cases of Byford-Fenger). It has been asserted concerning *abdominal pregnancy*, that emotions and violent physical shocks at the period of conception have driven the ovum from the tube into the peritoneal cavity, either by the force of the shock or by anti-peristaltic movements of the tube (*Walther, W. A. Freund*). But Virchow, Hecker and others have shown that circumscribed *peritonitis*, by narrowing the tube or rendering it impassable or fixed, may be the most frequent cause of tubal pregnancy; the *left* tube is said to be affected oftener than the right. Breslau, Beck and Wyder assumed that occlusion of the ostium of the tube by a uterine polypus may be a cause of intestinal pregnancy; but far more important than all these causes (which, in the larger number of extra-uterine pregnancies, are almost self-evident or but too obvious) *is the partial or entire loss of the ciliary movement of the epithelium of the tubes* (as demonstrated by Th. Wyder) which retards or arrests the advance of the ovum. Gonorrheal salpingitis may, therefore, play an important rôle in the etiology of extra-uterine gestation.

An external transmigration of the ovum may, of course, take place as well as an internal one, from the uterus into the tube; the latter is very rare. Myomata of the uterine wall (*Holtz* and *Harley*) may likewise hinder the entrance of the ovum into the uterus.

A woman may conceive through a fistula in the vaginal vault after a supra-vaginal amputation of the uterus with retention of the ovaries (*Köberle*), and the ovum may even enter the abdomen through a fistula of the uterus left after a Cæsarean section (*Lecluze*).

As to the frequency of extra-uterine pregnancies we have no reliable data. Löw found one such case in 400,000–500,000 deliveries, Arneth one among 3542 clinical labors; I have observed 13 cases in about 20,000, while Bandl, of Vienna, encountered only three cases in 60,000; accidents, perhaps also a certain attention in the diagnosis, enter into the consideration of the statistics. Multiparæ between thirty and forty years, and primiparæ who have been sterile for a long time after marriage, are said to be predisposed to the affection (*Hecker*).

Diagnosis.—Various efforts have been made to make the diagnosis of extra-uterine pregnancies, especially in the earlier stages, appear very difficult, if not impossible. This is natural, for it serves, in part, as an excuse, in case the diagnosis had not been made before the autopsy, and the ectopic gestation was then a surprise; in part, it serves to exalt the merits of the fortunate diagnostician, and the endeavor to elucidate this point is but human. I shall try to show that the diagnosis is not, in fact, so difficult, and I believe myself justified in so doing, since my experience in this direction (13 cases) is inferior to that of but few authors, and because I have been able to prove, in half of my cases, the correctness of my diagnosis by the elimination of fœtal parts (6 cases) or by autopsy. Here, too, we must distinguish three groups of symptoms: the uncertain, the probable, and the positive. I will not attach any special value to the uncertain class, such as nausea, vomiting, salivation, colic, lassitude; but I repeat that, as a rule, they occur early and are exceptionally severe, so that the physician is called in, and they thus lead to a timely diagnosis of an *existing tumor*, the changes of which, in the further observation of the case, are of the greatest importance. The *probable* symptoms are far more important, viz.:—

1. The cessation of previously normal menses;
2. Hyperæmia and secretion of the breasts;
3. Hyperæmia and livid coloring of the vulva and vagina, which increases toward the portio vaginalis;
4. The strongly pulsating arteries in the vault of the vagina;
5. The softening, enlargement and displacement of the uterus;
6. The clearly defined and growing tumor; and,
7. A vascular murmur or souffle above the symphysis, which is heard at a rather early period.

All these symptoms, to be sure, are not positive when considered singly, but in their entirety they permit a certain diagnosis, especially if *their progressive increase* is established by *repeated observation*, which is by no means difficult. It is noteworthy that they are even more pronounced than in normal pregnancy; for the pain and tension of the breasts are often very evident, so that attention is called early to these marked changes. The space in the small pelvis, moreover, is filled up more rapidly by the ectopic ovum, because the uterus becomes so hypertrophic that not only is its projection above the symphysis, but also the *growth of the tumor* is more readily recognized and more quickly brought about than in normal gestation. The size of the tumor sometimes leads to the supposition that pregnancy has advanced further than is really the case. In addition, there is the 8th point: the importance of *rhythmic contractions of the uterus*, though these occur usually only in the second half (*Grandin*); they manifest themselves by the patient's sufferings, and may be felt by the hand placed upon the uterus or tumor. It must be admitted that even the major part of these symptoms are amply sufficient for the diagnosis of pregnancy, and if the *tumor* be felt *alongside* the uterus, for ectopic gestation.

The condition having been established thus far, the diagnosis is at last rendered certain by the discharge of the *decidua* of *pregnancy*, which is distinguished from the decidua of menstruation by its size, thickness and the characteristic decidua cells (see Fig. 3). According to my experience, in at least two-thirds of all cases, the decidua is expelled within the first four months, not only after the death of the fœtus, but also when it survives.

These discharged pieces are so large that they may appear to the patient to be an aborted ovum. The decidua often forms a complete cast of the uterine cavity, and has, therefore, three apertures, at the tubes and the internal os; the protuberances may be recognized on the outside and the depressions on the inside (see Fig. 2). If it has been expelled before the arrival of the physician, he will be informed by her that she has passed membranous masses with labor-like pains. We are then justified in *introducing a sound into the uterus*, and thus to establish *its emptiness*, the enlargement of its cavity, and the thickening of its wall. I have been able to establish the latter condition in my first case, which taught me also that the sound may be caught in the uterine mucosa, and thus render the measurement inaccurate. Though the use of the sound has been cautioned against (*Kiwisch*, *Fränkel*, *Freund* and *Bandl*), because its introduction may cause uterine contractions extending to the fœtal sac and leading to rupture—or may possibly perforate the soft uterus—I consider the latter objection a purely theoretical one, and the former to be entirely devoid of danger, provided the sound be used only (as in my own case) after the decidua has been discharged. While the decidua still remains, in all probability, in the uterus, sounding is contra-indicated; but if the physician himself has examined the cast-off decidua, the sound is no longer required.

If the tumor in the beginning be situated laterally and have a spindle or oval shape, I would diagnosticate tubal pregnancy; if it adhere to one side of the uterus and form, like a myoma, a prominence in the region of the insertion of the tube, we must suspect interstitial pregnancy; but if it be situated at the posterior uterine wall, in Douglas' pouch, or in front of or above the uterus, it would indicate an ovarian or abdominal pregnancy. Tubal pregnancies are the most frequent; but since the diagnosis (whether tubal or ovarian pregnancy) often cannot be positively made even at the autopsy, owing to adhesions to the neighboring organs, this diagnosis is generally uncertain in the living. In the cadaver, I should say that the probabilities were greatly in favor of ovarian pregnancy, whenever the outer coat of the ovary passes uniformly into the ovisac and the surface of the latter resembles an ovarian tumor. This diagnosis would be assured only when the fimbriæ and the tube are found on the tumor itself as in the case of ovarian cysts, or when ovarian follicles are discovered under the microscope in some parts of the tumor.

This condition has recently been mistaken—and this is pardonable—for *retroflexion of the gravid uterus*. But, in the latter, the fundus uteri cannot be felt externally or alongside of the tumor; the changes in the portio vaginalis, its forward and upward displacement, together with a swelling of the posterior lip, are also characteristic and easily recognized. Moreover, the symptoms of incarceration, especially ischuria, are very seldom absent after the third month, while I have never met with ischuria in extra-uterine pregnancy, since the ovum does not come in direct contact with the neck of the bladder, and, relatively, grows more easily out of the small pelvis. It did occur, however, in the case observed by Barbour, in which the diagnosis had been rendered impossible, because the uterus had become imbedded in the anterior wall of the tumor, to which the intestine and omentum had also become adherent; a decidua does not seem to have been thought of.

Though I admit that the diagnosis may be difficult, and that, aside from the diseases mentioned, the condition may be confounded with hæmatocele, pelvic abscesses, fibroma, colic, etc., I repeat that I do not consider the diagnosis as difficult as Spiegelberg and others tried to make it appear. The fact that the diagnosis was established in only 15 cases of Hennig's 150 proves nothing, since these cases were collected from the entire literature of private and hospital practice.

Prognosis.—The prognosis differs according to the individual cases; the most frequent form, *tubal* pregnancy, seems also to be the most dangerous; in the *interstitial* form rupture always (?) occurred (*Cauwenberghe* 33, *Hecker* 26 cases); in the strictly tubal form, in five-eighths of the cases (*Cauwenberghe*, 46 with 33 fatal cases; *Fränkel*, 42 with 23 fatal). Rupture with fatal hemorrhage is the most frequent termination; pyæmia, septicæmia and peritonitis are much rarer. Recovery took place in tubal pregnancy, according to Hennig, in 4.6 per cent. of the cases which were left to nature, while of those which were treated 7.3 per cent. recovered. *Abdominal pregnancy*, according to Cauwenberghe, is the most favorable; for, of 128 cases, gravidity was unusually prolonged in 85, 56 of which recovered, while 29 died. But for all that we should not overlook the fact that the cases which took the form of *pelvic hæmatocele* or *subperitoneal hæmatoma* and terminated favorably could not be included in the calculation, and their omission renders the prognosis much worse. This will help to explain such statistics as those of Puech, according to whom, of 100 tubal pregnancies, rupture occurred in 98, of which 97 were fatal, while 2 others died from causes other than the rupture. The time of rupture, in the interstitial cases, was usually in the third month, the remainder occurring between the fourth and twentieth week; in the strictly tubal cases, most frequently between the third and fourth month, sometimes between the fifth and seventh week, and, in a few cases, in the fifth month. There is still so much uncertainty about ovarian pregnancy that it cannot be compared with the other forms.

Treatment.—While we are assured, on the one hand, that the diagnosis is quite difficult, especially in the beginning, and are urged, on the other hand, after the diagnosis of tubal pregnancy has been made to perform immediate laparotomy, it must be admitted that this advice requires careful consideration, since to err is human, and laparotomy after all is not an indifferent matter. It might be better, therefore, in the first place, to resort to less dangerous measures. The first among these is *electricity*, which has been productive of good results, according to American authors. Rockwell applied one electrode in the vagina and the other on the integument, using a current of 18 elements; C. Cocks (New York), after having failed with the faradic current, terminated a tubal pregnancy in the third month by the application of the constant current from 17–30 elements in three sittings; one electrode was placed in the rectum and the other in the vagina in front of the tumor. Three or four weeks after the first application menstruation appeared, the fundus became smaller, and at the expiration of six months was reduced to the size of a hen's egg; two months later it could scarcely be felt (see report of Cocks). Fanny Berlin successfully employed the galvanic current of 2–18 elements. Mundé (New York) at first used the *galvanic* current from 24 elements for ten minutes with several sudden interruptions, but without success; symptoms of collapse appeared; he then substituted the *faradic* current with success (one pole in the rectum, the other externally).

An equally certain method, and one which appears to me less dangerous, is the *injection of drugs* for the purpose of killing the fœtus. It was Joulin who proposed this method (1862), but Friedreich was the first to apply it in practice (1864). Cases of this kind have been reported by Friedreich (2), Kœberlé (1), Fournier (1), and Rennert (1); in addition to these, the author presented five before the Gynæcological Society of Munich, in the summer of 1887, and since then has observed a sixth case. Of these 11 cases, three were fatal, one of Fournier's, and another which was treated by the author with *morphine* for the second time (see Figs. 59 and 63). The author always injects 0.03 gm., under the usual precautions, through the abdominal walls at intervals of six to eight days; two to three injections generally suffice. Aspiration of the liquor amnii is not necessary. This method of killing the foetus may be successfully practiced up to the end of the fourth and even during the fifth month; it is very easy of performance and perfectly innocuous to the mother. The result is striking: the pains abate at once, though vomiting continues for some time; the abdomen becomes softer; the tumor diminishes perceptibly in a short time and disappears almost completely, as a rule, within six months to one year. The relaxed breasts cease to secrete, the pallor of the patient diminishes; her appetite improves and she is evidently on the road to recovery. The fœtus having been killed, we are restricted to symptomatic treatment, and must endeavor to combat the constipation which is usually present and any symptoms of acute or chronic peritonitis which may appear, also hemorrhages from the uterus, debility and any pyrexia that may arise. Should symptoms of internal hemorrhage appear suddenly, horizontal position, absolute rest and an ice-bladder to the abdomen are the first remedies; hypodermatic injections of ether are indicated, and ice, wine and champagne internally; if a fatal issue threaten—a supposition which may be merely subjective and, of course, would not be confirmed by the patient's recovery after laparotomy—we must at once perform laparotomy and extirpate the ruptured tube. Numerous recent observations have demonstrated that the patient can be easily and safely restored to health in this way; yet there are many failures on record, and we must not forget that patients have recovered after the rupture of an extra-uterine pregnancy without laparotomy, in which case they are, at any rate, in a more favorable condition, having no yielding cicatrix in their abdominal wall.

If an abscess form we must try to remove the pus as soon as feasible, and endeavor to make it point externally by applying hot poultices. As soon as distinct fluctuation is felt anywhere in the abdominal wall or the vagina, an incision is to be made in order to allow the contents to escape. A very interesting case has been reported by J. H. Mathieson (Ontario), in which a child, weighing nearly 3 kgm., was extracted with the forceps by colpotomy, and the placenta subsequently easily detached. It was probably a case of tubal pregnancy (*Lancet*, 1884, 24, IV, p. 290). T. Gaillard Thomas, basing on an experience with 24 cases, cautions against interference, especially against aspiration, since three of his cases thus treated terminated fatally. He advises the application of the faradic current, which, at all events, would be harmless. According to Schroeder, extra-uterine pregnancies up to the third month may be destroyed by injections of morphine. He advises expectant treatment if spontaneous rupture of the sac take place.

My views and observations agree most closely with those of Freund, who advised to kill the fœtus in all cases within the first three months by aspiration (better by an injection of morphine). If this does not succeed, he advises expectant treatment, but never operation. When the fœtus is living, *laparotomy* shortly before term; when the fœtus is dead, to delay as long as possible; when an abscess forms, laparotomy, sewing the fœtal sac to the abdominal wall, then opening of the sac; allowing the placenta and membranes to come away spontaneously, disinfecting the cavity and packing it with cotton.

In cases where fœtal heart-sounds are heard distinctly and the mother is in fair condition, laparotomy has been repeatedly performed when the child was vigorous and viable, sometimes saving both (*e.g.*, Schreier, of Hamburg and Pauk). The earlier statistics by Hecker—which showed that operative interference gave generally unfavorable results, and that the greatest danger lay in the profuse hemorrhage caused by detaching the placenta, which accident we have no reliable means of preventing, since the placenta is most commonly attached about the pelvic inlet—have been proved unreliable by more recent observations.

All the recent authors, Cattani, Chauvenet, Freund, Frommel, Kaltenbach, Negri, have simply allowed the placenta to remain after laparotomy for abdominal pregnancy, the sac having been previously stitched to the abdominal wall. Horwitz even did so some days before opening the sac. After evacuation it is thoroughly cleansed with sublimate, and then either permanently drained per vaginam or dusted with powdered tannin or salicylic acid (*Freund* and *Kaltenbach*). *Colpotomy*, which has been recommended, is much more difficult and dangerous; as a rule it is contraindicated, except when an abscess threatens to rupture into the vagina. But there are instances (as the one mentioned above by Mathieson) in which this operation has been performed with success. Pinard, too, operated on a IIIpara, 31 years old, at the normal end of pregnancy, by cutting through the posterior vaginal vault, and irrigated the cavity with a 1 : 2000 sublimate solution every two hours, without producing any toxic effects. The woman recovered; the placenta came away after eighteen days.

CHAPTER II.

Diseases of the Fœtal Membranes.

(a) Endometritis membranæ deciduæ veræ. Hydrorrhœa uteri gravidi.

LITERATURE.

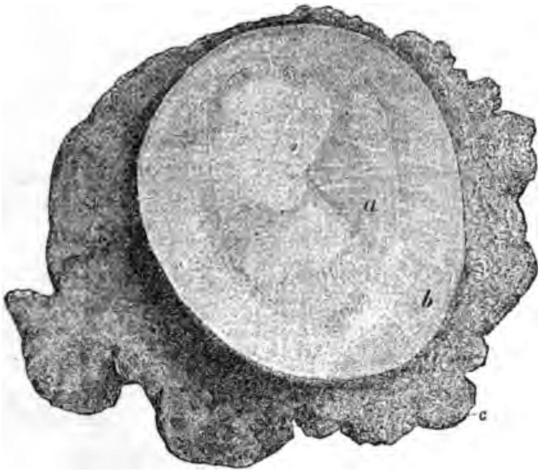
Earle, C. W.: "The Watery Discharges of Pregnant Women." *Chicago M. J. and Examiner*, 1886, LII, 112–116. Hegar: *Monatsschrift f. Geburtsk.*, XXI, 1. Mijulieff, A.: "Hydrorrhœa gravidarum." *Nederl. Tijdschr. v. Geneeskunde*, Amsterdam, XXIII, 206–220. Smith, T. C.: "The Watery Discharges of Pregnant and Puerperal Women (Hydrorrhœa gravid. et puerp.)." *Am. J. Obstetr.*, New York, 1885, XVIII, 449-464.

Hegar has proved that an *abnormally increased proliferation of the uterine glands* of the decidua vera forms an anatomical cause and explanation of its increased secretion, so that, owing to the latter, the decidua vera and circumflexa are but incompletely, if at all, brought into contact with each other. The secretion then accumulates between the two deciduæ, gradually overcomes the resistance at the internal os and escapes. There is no doubt of the permeability of the fœtal membranes, and hence, of the possibility of the transudation of certain quantities of liquor amnii between amnion and chorion and between chorion and decidua circumflexa which may be expelled with labor-like pains, without any rupture of the membranes or the occurrence of premature labor. In support of these views I desire to quote West and Barnes ("Obstetr. Med. and Surg.," 1884, vol. 1, 446) and to present the picture (see Fig. 64) of a fœtus which came away in the second month of gestation and showed large quantities of liquor amnii between amnion and chorion.

Barnes claims, furthermore, to have observed a case of hydrorrhœa of the gravid uterus in the last three months of pregnancy, in which the discharge amounted to a pint or more daily, and certainly was derived from the cervical glands. He compares this cervical hypersecretion to the salivation of pregnant women.

Symptoms.—In the beginning—rarely as early as the second or third month, but generally after the middle of a previously normal pregnancy—a moderate discharge flows from the genitals of the patient, which may occur in bed as well as while walking about. It is generally most marked in the morning, and appears in amounts ranging from a few drops to a teacupful or more. It escapes either without any sensation or is preceded by labor-like pains, which cease after a copious discharge has occurred. Some patients are entirely unaffected by the discharge, while others are exhausted, lose strength, and a pronounced anæmia may follow. Therefore, premature labor frequently occurs, but pregnancy usually goes to or near term. Pus is sometimes mixed with the glairy secretion, caused by an endometritis or colpitis; it is sometimes of slightly sanguineous color. The discharge is sometimes checked, the abdomen becomes greatly distended by the accumulated secretion, and diminishes only after the resistance has been overcome by uterine contractions and the liquid contents have been discharged. During the escape of this fluid the external os is either open far enough to admit the finger or it appears almost impassable. There are no prodromal symptoms, and when followed by premature labor, some weeks intervene between this accident and the beginning of the affection. Hypersecretion sometimes occurs in successive pregnancies (Alexander's case, fully reported by Smith,

FIG. 64.



Amnion and chorion separated by large amounts of liquor amnii. *a*, amnion; *b*, chorion; *c*, decidua circumflexa.

of Washington; see above). Many patients go to full term, though having copious discharges of this kind for months.

Diagnosis.—The secretion escaping from the genitals must be distinguished, first, from the *liquor amnii* by the absence of vernix caseosa and lanugo, as well as by the fact that premature labor does not occur, or else follows only after a long interval. Second, from urine, by the fact that the urea contained in it is in small quantities, that the reaction is neutral or alkaline, and by the proof that the discharge comes from the uterus. Third, from the secretion of cervical endometritis and colpitis (which may be rather profuse) by the absence of pus and fungi.

Etiology.—We find this disease especially among multiparæ; previous severe *uterine catarrhs* (*Hegar*) are also to be considered as causes. I have repeatedly observed it in younger women who were pregnant for the ninth time. They were delivered easily at term, and recovered completely. It is also met with in delicate, somewhat anæmic and hysterical women, and in those affected with heart disease. It also occurs in non-pregnant patients, although very rarely. The fluid, which was examined in such a case by Oliver (*Brit. Med. Jour.*, 1884, May 24th, p. 993), contained a large quantity of the chlorides, no *albumin*, epithelia, and had a specific gravity of 1.003. 408 gm. were discharged every four to six hours. Carcade ascribed the origin to pemphigus of the vagina and uterus, without, however, having seen it in the latter.

The *prognosis* is rather favorable, unless the patient is too much exhausted by the great loss of fluids. The fœtus, as a rule, is by no means puny, and premature labor, though frequent, is not always a necessary consequence. The disease generally disappears after delivery; in rare cases it remains for a few days or weeks, as proved by the cases of Denman, Chailly, Sinclair and Ashwell (Smith, see above).

Treatment.—Rest and abstinence from abundant or strong drinks are indicated. A menstrual binder to prevent excessive refrigeration and astringent injections may be tried. Narcotics are also indicated when abortion or premature labor threatens. The use of bromide of potassium may also be considered analogous to the treatment of salivation in pregnancy. Jackson recommended arsenic. Finally, albuminate of iron may be given for the anæmic condition; diuresis and defecation must, of course, be regulated.

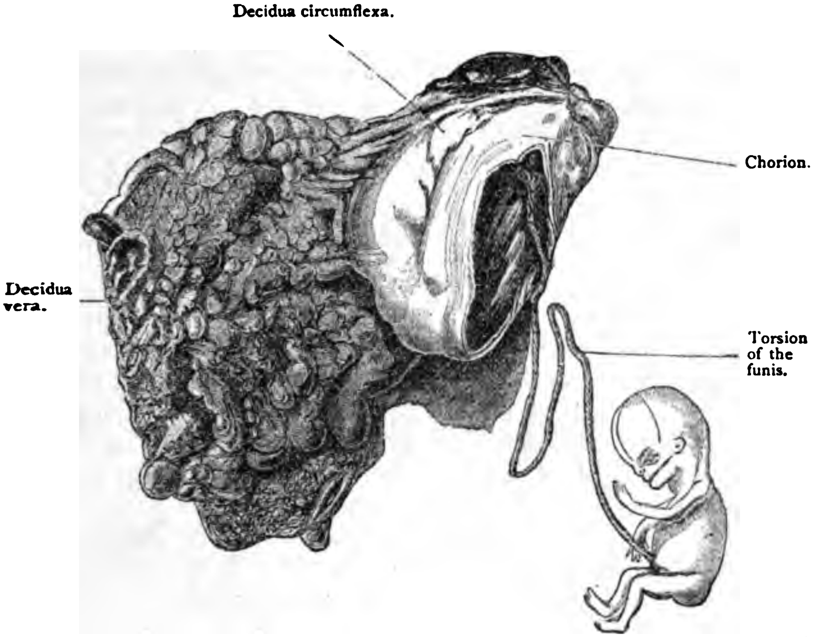
(b) Endometritis Polyposa.

LITERATURE.

Virchow: *Monatsschrift f. Geburtskunde*, XIX, 242. Ward, A.: "Decidua tuberosa et polyposa." *Brit. Med. Journ.*, London, 1884, I, 584.

Another form of *hypertrophy* of the *decidua vera* is that described by Virchow and Strassmann, of polypoid proliferations which consist of a strong fibrous stroma with large lentil-shaped cells without any fatty degeneration. The arteries are surrounded in some places by thick concentric layers, while at other points the vessels are sinuous and dilated and form a wide-meshed framework. In this manner polypoid growths are formed, which may be sessile or pedunculated, are very vascular, and hence liable to complicate pregnancy by circulatory disturbances (see Fig. 65). Ward found on the decidual surface, which was turned toward the ovum, polypoid excrescences one-eighth to one-fourth inch long, filled with coagulated blood and connected by small bands of decidual tissue. The patient, at the time of conception, had passed through a very severe attack of croupous pneumonia. Secondary syphilis was present in Virchow's case, but could not be proved in Strassmann's case. In Gusserow's case it was noticed that the pregnancies followed each other in too rapid succession.

FIG. 65.



Endometritis. Decidua polyposa. Apoplexies of the chorion. Torsion of the umbilical cord. May, 1887.

(c) Atrophy of the Decidua Vera.

The decidua vera is sometimes very thin; instead of the characteristic cellular forms, numerous round or oval nuclei or isolated cells containing droplets of fat are found. The juga and vallicula of the normally developed decidua are usually absent. Extravasations of blood, in spots, are very often present.

(d) Formation of Cysts in the Decidua Vera.

This condition occurs in the form of small vesicles varying in size from a pea to that of a hazelnut, which are filled with a clear fluid. They are due, according to Hegar, to uterine catarrhs, by a dilation of the uterine glands, with damming up of their secretion.

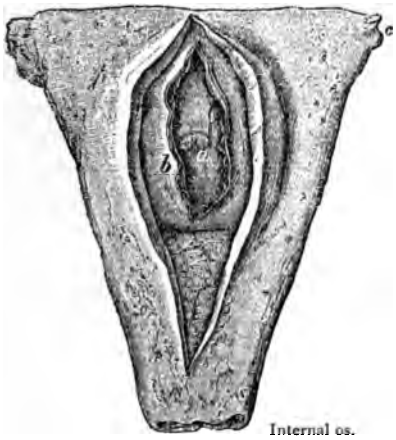
(e) Apoplexy of the Decidua Vera.

It is found partly on the external or internal surface, partly in the stroma; the blood flowing out into the uterine glands frequently forms club-shaped prominences, either in isolated spots or over the entire circumference. Such an apoplectic effusion may extend through the entire thickness of the decidua vera. It is sometimes associated with apoplexy of the circumflexa; at other times it is quite circumscribed and may (as can be seen very clearly in a specimen in our collection) produce a rosary-like prominence on the inner surface of the decidua.

All these diseases are likewise found in the decidua circumflexa. H. Müller believed a *complete absence of the decidua circumflexa* to be possible. Sackreuter, Mettenheimer and Rokitansky observed absence or *atrophy* of the decidua, and thought that in such cases the circumflexa was torn asunder by the weight of the ovum. With a defective development of the decidua vera and circumflexa, the ovum may be drawn out into a pedicle, and, entering the cervical canal, may be detained there for a while, until, finally, it is expelled with severe hemorrhages or sloughs. This condition has been called *cervical pregnancy*, which, however, is not an appropriate name. Hegar has described the following three forms of disease in the *decidua serotina* or *maternal placenta*, viz.: 1, abnormally *small bulk* and *atrophy;* 2, *hypertrophy*, the part being either uncommonly thick and its isolated and grouped glands abnormally developed, or the development of the serotina occupying nearly one-half of the periphery of the ovum. It may also be drawn out in the form of a pedicle. *Extravasations* into the decidua serotina occur most frequently, and authors concur in designating it as the point at which primary effusions of blood are most common. Hegar ascribed the causes of the latter less to a suddenly occurring *hyperæmia* than to abnormities of *decidua serotina* of longer standing, such as atrophy and hypertrophy, death of the embryo, faulty insertion of the allantois or the umbilical vessels. This so-called *placentitis* is, therefore, a consequence of a former endometritis which affects, constricts, and destroys the uterine glands, and narrows and occludes the maternal vessels by a proliferation of the intercellular substance. Thus, an ampullary layer cannot be formed, and the placenta, subsequently, can detach itself but very slightly, if at all, from the wall; it remains, in part, behind. The exudation may also break through into the embryonic sac. Under these circumstances the *chorion* is usually opaque; the development of the villi is asymmetrical; the *amnion* is loosely connected with the *chorion*, or separated from it by extravasated blood. The amniotic cavity is commonly found filled with a cloudy, brownish or bloody liquid; sometimes an embryo may be detected (Fig. 66), but more frequently only a short piece of the umbilical cord, and generally also the *umbilical vesicle*. In one of Hegar's cases an embryo, which was but 1 cm. long, was found in an ovum which had been carried for five or six months. I have also observed several similar cases.

Symptoms of these Affections.—When a rupture of utero-placental vessels begins with discharge of blood and detachment of the placenta, or when one of the above-mentioned diseases develops, the embryo either dies or the uterus reacts upon its contents by contractions as though they were a foreign body. A premature expulsion of the fœtus follows: *abortion* or *partus immaturus*, according as the ovum is under or above 16 weeks. The most common symptoms of this process are: hemorrhage frequently preceded by chills, fever, a feeling of discomfort and slight colic. There is considerable loss of blood, which is somewhat diminished after the death of the embryo. Then follow pains, evident uterine contractions, which are often unusually severe, and effect a slow or gradual dilatation of the external and internal orifices of the uterus and the descent of the membranes into the os. The contractions sometimes occur at long intervals and may be arrested; but *as soon as the* extremity of the membranes begins to protrude

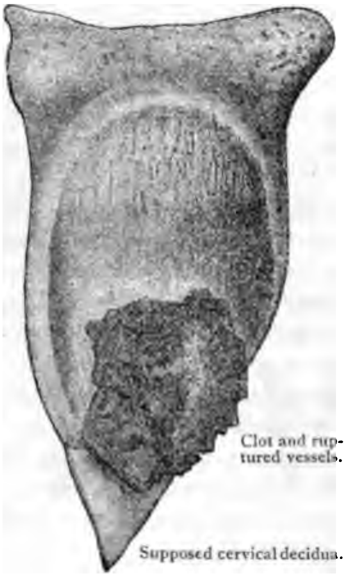
FIG. 66.



Ovum 8.5 cm. long, 7.5 cm. wide, incised through the posterior wall. Embryo of 8 mm. carried from the end of March to June 13th, 1887. *a*, embryo; *b*, decidua circumflexa; *c*, tubal orifice.

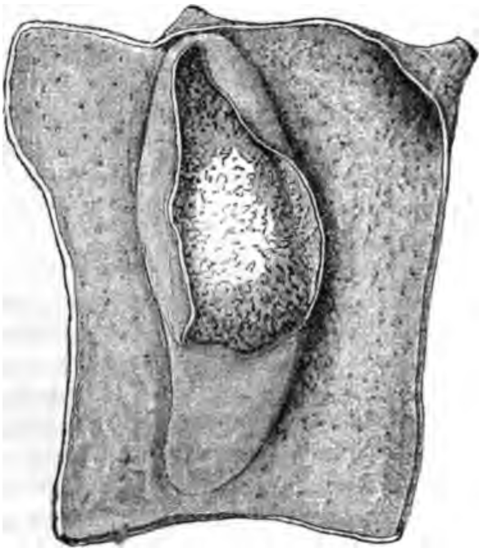
into the os uteri there is no hope of averting the abortion. It is the same in *animals*, though there are remarkable exceptions (comp. Frank-Göhring) in which the membranes of the sac which protruded from the vulva were cut off and the mare bore a strong colt three months and two days afterward.

FIG. 67 A.



Ovum of two months, intact, seen from the side of the decidua serotina. Natural size.

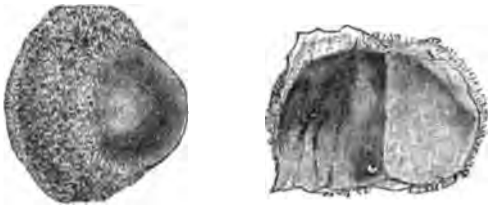
FIG. 67 B.



The same ovum seen from the opposite side. Decidua vera and circumflexa opened; the latter dissected off for a distance, after preservation in glycerin; the ovum is found in one tubal angle.

The modus of *elimination of the fœtus* differs according to the causes. On the one hand, the entire ovum, together with the decidua vera and circumflexa, may pass in the very first months (see Figs. 66 and 67); on the other

FIG. 68 A. FIG. 68 B.

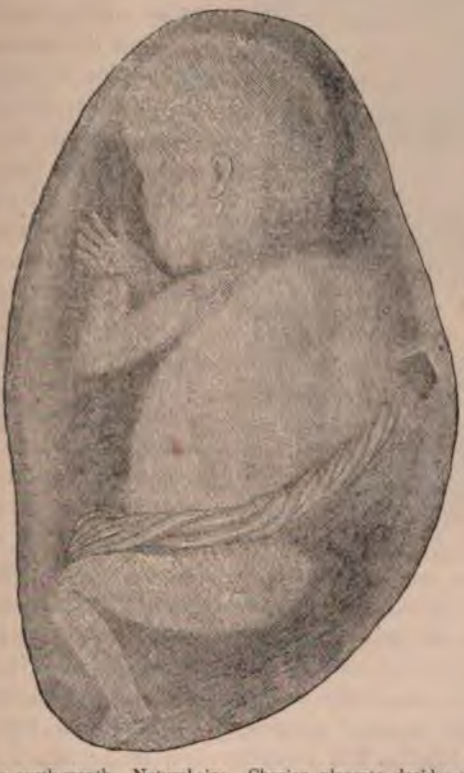


Closed. Opened.

Ovum of the *first* month. The deciduæ have remained behind, the amnion has broken through the chorion. Natural size. Embryo stunted by 1.5 mm.

hand, the ovum may become detached from the decidua serotina, while the decidua vera remains behind. In addition to this, the decidua circumflexa may be torn in the descent of the ovum, and the ovum born may consist only of chorion, amnion, embryo and liquor amnii (see Fig. 68). The decidua vera and circumflexa, with the serotina, follow later, or, lastly, the chorion is ruptured in the descent of the fœtal membranes; the amnion alone passes through unimpaired, and the umbilical cord is torn from the placenta without rupture of the amnion and the escape of the liquor amnii. The remaining membranes become detached and effect their escape after some time.

FIG. 69.

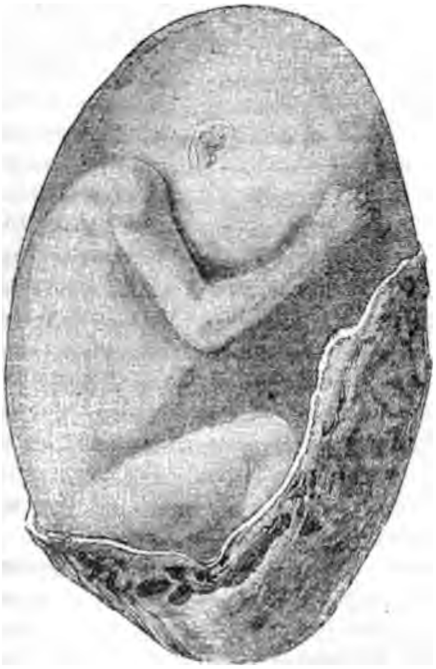


Point where the funis is torn off from the placenta.

Partus immaturus of the ourth month. Natural size. Chorion, placenta, decidua circumflexa and vera are entirely torn off, the amnion alone inclosing the fœtus. Spontaneous expulsion.

The retention of the deciduous membranes occurs most frequently in the first and second months, because at this time the connection between the villi and uterine wall is not, as yet, very intimate. The last-mentioned form of expulsion (in which the amnion alone incloses the fœtus) is the rarest of all, but may happen (see Fig. 69) even in a fœtus of four or five months.

FIG. 70.



Partus immaturus of the fifth month. Chorion and decidua circumflexa torn off.

The decidua vera and circumflexa and the chorion are not infrequently found torn off in a fœtus of four to six months (see Figs. 12 and 70), the placenta fits like a cap over a part of the fœtus, and the amnion alone is discharged intact.

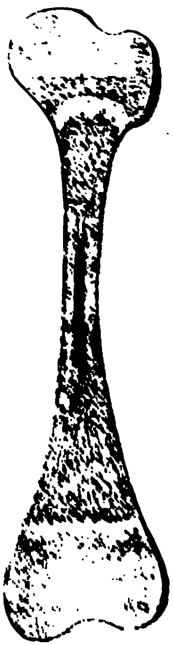
When the ovum is ruptured, the fœtus may be expelled, and only the decidua, interspersed with effusions of blood, will remain behind; such ova have been termed "*blood moles.*" If a dead fœtus of four to six months be retained for some time, it becomes *macerated* in the liquor amnii, *i. e.*, the epidermis is raised in blisters, which break and peel off; the bones become loosened from their articulations; the cavities of the body contain a bloody serum; head, trunk and extremities are compressed, flattened, dislocated and distorted. If the fœtus be retained still longer in the uterus, it may (as in the case of M. Skjelderup, Christiania) remain to the normal end of pregnancy and dry up. Hemorrhages finally take place, the fœtus and placenta are expelled, the former in a mummified and the latter in a more or less fresh condition. If, however, air has gained access to it, maceration may lead to putrefaction and sloughing, and the fœtus may be expelled piecemeal. It has even happened (*Oldham, McClintock*)—in English this condition is termed "*missed labor*"—that the fœtus was retained in the uterus beyond the normal time. A *lithopædion* may also be formed, it is said; but this happened when the fœtus was situated in a rudimentary cornu or had passed from this into the uterus.

If the entire ovum be not expelled, and portions of the decidua vera or placenta remain behind, the hemorrhages continue; they are sometimes associated with uterine contractions. *Fibrinous* and *so-called placental polypi* are frequently formed from these remnants. They become coated over with the escaping blood, are rounded off, and new fibrinous layers are constantly deposited upon them. The larger such polypi become, the more profuse will the metrorrhagia be, until they are detached and expelled by uterine contractions or slough away.

Diagnosis.—A threatened premature labor should at once be suspected when any hemorrhage—be it ever so small—occurs from the genitals of a gravida. Its onset can only be ascertained by manual exploration, from the detachment of the lower pole of the sac. The demonstration of fragments of membrane, especially of villi, will show that an abortion has taken place. Whenever the external and internal orifices are patulous, the uterus, by lifting it from the outside, should be pressed over the point of the finger, so that its inner surface may be palpated and any fragments of the ovum detected. But where the hemorrhage is slight, the external os closed, the uterus still enlarged and soft, and an expulsion of the fœtus has not been ascertained, it must be assumed that pregnancy still continues, and we should endeavor to prevent abortion by all means. Wherever, after the expulsion of the fœtus, considerable hemorrhage continues and the cervix reopens, fragments of the membranes or placenta probably remain behind, and this is certainly the case when the discharge is offensive and is mixed with shreds and coagula in which pieces of decidua or villi are found. The cautious use of the *curette* will readily render the diagnosis positive in doubtful cases. In persons subject to habitual abortion the appearance of even a slight hemorrhage is an almost certain sign of the onset of a new abortion.

Etiology.—Hegar's theory is of paramount importance here; he states that *the causes of premature expulsion of the fœtus are generally to be dated further back than is usually done;* also, that hemorrhages into the decidua serotina are rarely primary, but commonly the consequences of previous diseases of the embryo and the decidua. Abortion is most frequently the result of the death of the fœtus. The causes, however, should be looked for, in part, in the *condition of the mother;* for previous abortion always engenders a predisposition to abort in subsequent pregnancies; but the gestation may also be interrupted by *constitutional diseases*, such as tuberculosis and syphilis, or by *acute infectious diseases*, such as pneumonia, typhoid, cholera, measles, small-pox, death of the fœtus being caused partly by the high temperature of the mother, and partly by the schizomycetes which pass through the placenta. *Malaria* is among the doubtful causes, according to Grandin; diseases of the heart, lungs, kidney and liver often lead to abortion by passive hyperæmia. Another cause is defective involution of the uterus after preceding parturition with subsequent uterine inflammation (*Moses Fritsch*, of Breslau). Similar effects are produced by active *physical exertions* or *psychical emotions:* jumping, dancing, falling, driving over rough roads, severe coughing, fright, vexation and profound sorrow. All of these factors lead, partly, to a considerable rise of temperature, partly to prolonged hyperæmia and accumulation of carbonic acid in the pelvic organs, partly to great congestion and exhausting losses of fluids in other organs, and, finally, partly to rapid and marked changes in the blood pressure and a consequent deficient nutrition of the embryo. Abortion may, moreover, sometimes be produced by obstruction to the development of the uterus, as is caused by *ovarian tumors*, *uterine myoma* and *adhesions* between the uterus and the neighboring parts; by cervical lacerations, retroversion of the gravid uterus, also by prolapse, cicatricial stenoses of the vagina and fixation of the cervix by deep cicatrices of the vaginal vault.

FIG. 71.



Thigh-bone with syphilitic osteochondritis in a new-born child, who died of syphilis on the fourth day.

Causes on the part of the mother are: *direct irritations* acting upon the uterus, such as violent coitus, irritation of the nipples, diseases of the cervix.

Many medicaments have been esteemed as abortifacients, and have been employed for that purpose, viz.: *ergotin*, *savine*, *grindstone water*, *green soap*, etc., but no positive proof of their power has been adduced.

Abortion in animals has been found to be sporadic, epidemic, epizoötic, or infectious (also contagious, but not miasmatic).

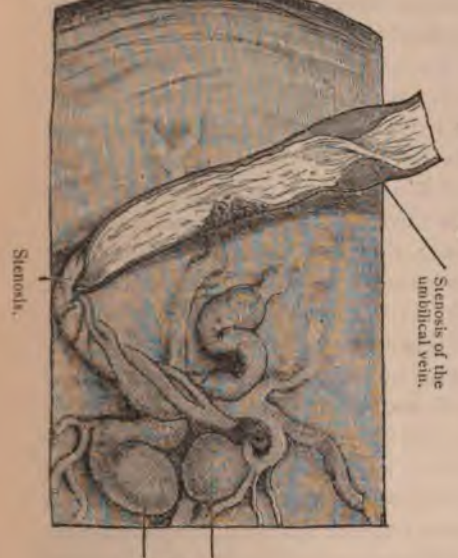
In animals the sire has been brought into relation with abortion, and this holds good as to syphilis in man; any other relation can hardly be demonstrated (*Franck-Göring*).

On the part of the fœtus, we might mention deformities, anencephalus, spina bifida, disease, and death, for instance, from strangulation by the umbilical cord, or the knotting of the cords of two fœtuses. The most frequent cause of fœtal death, however, is *hereditary syphilis*, among the most common consequences of which are—as we recognize in such cases, even on external examination—fœtal ascites and anasarca. They are connected with chronic diffuse interstitial hepatitis, with gummous tubercles in the liver, spleen, pancreas, kidneys, supra-renal capsules and lungs.

Osteochondritis at the boundary between the diaphyses and epiphyses (Fig. 71) is characteristic of syphilis. The umbilical cord often appears thickened and Wharton's gelatin œdematous; the intima of the vein or the arteries is frequently thickened, and hence the lumen of the vessels is narrowed. Such stenoses occur, however, in fully developed and strong children, but without any changes in the intima (Fig. 72). In the maternal placenta, gummous proliferations are also met with, near which the villi are thickened by an increase of their epithelium and infiltration of the matrix (*E. Fränkel*), [illegible] Torsions of the umbilical cord are very frequent (see below). Syphilis of the fœtus is the most frequent cause of recurring abortions (known as *habitual abortion*). *Placenta prævia centralis* and *lateralis* are also more common causes of abortion and premature labor.

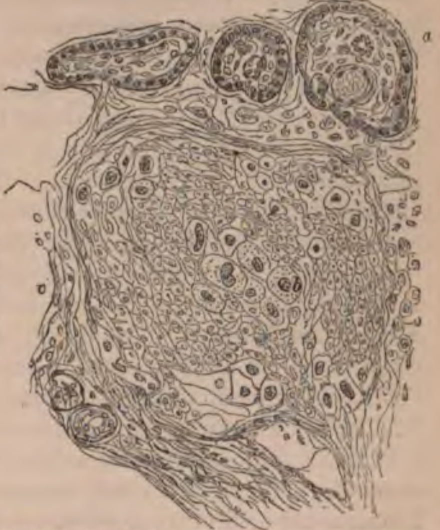
The *duration* and *prognosis* of *abortion* differ greatly, depending partly upon its causes and partly upon the condition of the os and cervix uteri. The pains are so violent that the patients (as one of them told me) would rather bear six fully developed children than pass through a single abortion. The hemorrhage connected with the expulsion of the ovum, even if it occurs as early as the first month, may be so profuse as to terminate fatally. The hemorrhage will cease sooner in proportion as less is torn off the fœtal coverings. If an abortion has terminated successfully, *defective involution* of the uterus sometimes remains as the result of the *cause* of the abortion, especially at the spot where the formation of the placenta had already commenced. Thus *displacements*, *flexions*, *versions*, *chronic catarrhs*, *anomalies of menstruation*, especially *menorrhagia*, may ensue. A predisposition to a recurrence of the abortion in the same or a subsequent pregnancy remains. The same experience has also been had in animals. This predisposition can only be considered as overcome when an abortion is followed by the birth of a mature fœtus.

FIG. 72.



Umbilical vein with two stenoses and marked phlebectasiæ at the placenta, *without* change of the intima. Very vigorous, healthy fœtus.

FIG. 73.



Syphilitic disease of placenta (gumma?). The placenta showed horn-colored crusts on the side of the amnion. *a*, villi with incipient proliferation of the epithelia; *b*, coagulation-necrosis with giant cells.

Treatment.—The *predisposition* to abortion is to be cured by removing all general or local existing causes, as syphilis, chronic catarrh of the lungs and intestines, kidney diseases, but above all, diseases of the genitals. Thus, in chronic catarrh of the uterus, good results are secured by *local astringent* injections, with tampons, cold douches, cold enemata, and warm or cold sea-baths, especially those of Schlangenbad, Pyrmont and Franzensbad. Mechanical treatment has often been employed with success in displacements.

Threatening abortion requires absolute rest, horizontal position, emptying of the bladder and rectum (castor oil, cold enemata). We may hope to prevent it when the os uteri is still closed, the hemorrhage is moderate, and the uterine contractions not too frequent. Under these circumstances its occurrence may be delayed for months. *Locally* tepid or cold applications to the abdomen, and injections of cold water, pure or mixed with vinegar, into the vagina. *Internally, opium* in some form (which may also be given per rectum, 10–20 drops of tinct. thebaica) or chloral hydrate (1 gm. per day). Slight local abstraction of blood by scarification of the cervix has also been recommended for endometritis. I am firmly convinced that this is of no use, but may do harm.

Abortion which is in progress must be treated on the expectant plan, and by rest in bed, provided the hemorrhage be not too profuse. The ovum should not be removed too early when it is felt within the os, because the uterus itself usually effects the expulsion in the most complete and gentle manner. If, however, the hemorrhage is *considerable*, the expulsion must be expedited; to this end we may give, with *good* results, an infusion of ergot (10–15 gm. in 175 gm.; smaller doses have no effect); or ergotini fluidi Kohlmanni 3 times daily 15–20 drops; or extr. sec. cornuti aquosi in pills of 0.05 every 2 hours; or hypodermatically, 0.05, once or twice a day, until the hemorrhage ceases completely. Cold enemata and vaginal injections are useful; and in sloughing of the fœtus, copious antiseptic intra-uterine injections of boracic or salicylic or carbolic acid solutions (three per cent.). If the hemorrhage still continue, the *vagina* must be *tamponed*, as long as the ovum cannot be felt, best with oiled tampons of salicylated cotton, which are preferable to the colpeurynter, recommended by many authors, because the latter does not so completely fill the vagina, is more readily forced out, and aids the treatment at most by its cold contents. By tampons, on the other hand, astringents and styptics (liquor ferri sesquichloridi) may be brought as far as the external os. If there be considerable uterine hemorrhage, and the dilatation of the os be very much delayed despite the tamponade, Tarnier's instrument may be used or the cervix be enlarged by metallic dilators. Dilatation by means of sponge tents (recently again recommended by Amussat) is not advisable. If there be no hemorrhage, the expulsion of the placenta must be left to nature. When the ovum has passed into the vagina, it should be removed and carefully examined. If the fœtal membranes have ruptured and the fœtus alone has passed, while the placenta remains behind and there is considerable bleeding, the uterus should be forced down by strong external pressure, and the palpable placental remnants be removed by two or three fingers; this had better be done under narcosis, since the removal is often accomplished but slowly and piecemeal. Or else, we may expose the cervix by a speculum, rapidly dilate the cervical canal with Fritsch's dilator, and extract the ovum with polypus forceps or with special forceps or spoons (*Hinrichs*). Sometimes expression succeeds by combining *pressure upon the uterus through the abdominal walls* and the vagina. If the fingers do not answer the purpose, the curette may be substituted. It should be used with great care, and only when the os uteri is exposed, and after careful irrigation of the uterine cavity. No force must be employed, since the uterus has been repeatedly perforated by the curette, and in one instance a physician has been convicted of manslaughter, where this accident resulted fatally. Nor should it be forgotten that the curette may infect healthy parts of the genital canal by inoculating them with the sanious masses which it has scraped off. In the winter of 1885–86 I observed in a patient, who was feverish when admitted, a left-sided parametritis from curetting; the pus burrowed under Poupart's ligament between the adductors of the thigh, and the patient remained dangerously ill for months. Immediately after curetting, the uterus should be irrigated with a three-per-cent. solution of boracic acid, wiped dry with an applicator wrapped with cotton, and an ice-bladder placed on the abdomen as a prophylactic measure. Küstner also warns against the rough use of the curette, and advises care, lest a local sepsis be made general. Vôhtz recommended Hegar's hard-rubber dilators, but condemned injections of chloride of iron; he laid stress upon the necessity and usefulness of early curetting, and also upon the error of tamponing when the fœtus is dead. Fars observed a case in which a laceration of the cervix had taken place in consequence of a physician's attempt to remove the remnants of an abortion with the fingers. Nevertheless, he recommends active interference, dilatation and the curette. Hemingway also resorts to active measures, using the finger and curette, and irrigates the uterus with *tincture of iodine*. Brannan, Doe and Southwick plead for expectant treatment, ergotin and tampons. Since opinions differ so widely, I will, in conclusion, again formulate my experience. I maintain that if, in an abortion or immature labor, fragments of fœtal membranes or placenta have remained behind, we are justified and obliged to proceed to operative interference only when there are severe hemorrhages from the uterus, or fever or sloughing set in. In the absence of these indications, I am strongly opposed to cleansing of the uterus, either by hand or instruments, because this method furnishes no guaranty against small remnants being left behind and against direct inoculation of sanious matters into existing lesions.

If the placenta remain behind and the internal os be closed or permit, at most, the introduction of one finger, or if even exudation can be detected in the neighborhood of the uterus, we must desist from any attempts at entering the uterus, but should administer the infusion of ergot, mentioned above, irrigate the uterus daily through a Fritsch or Budin catheter with an antiseptic fluid, such as solutions of boracic acid, carbolic acid, chlorine or permanganate of potassium (1 : 1000), and, as a rule, we shall find that in the course of from two to ten days the placenta is expelled completely and successfully. If marked anæmia have set in during the abortion, it is to be combated by nourishing, cold liquid diet, viz.: beef tea, milk, yolk of egg, red wine, cognac.

The *consequences* of abortion: defective involution of the placental site, protracted hemorrhages and resulting anæmia, also displacements of the uterus, require appropriate treatment. In the case of hemorrhage, cauterization of the inner surface of the uterus by the armed probe (silver nitrate: Chiari) might be employed. Undue exertions and premature sexual intercourse should be forbidden; irregularities in defecation and micturition should be corrected.

CHAPTER III.

Diseases of the Chorion. The Hydatiform or Vesicular Mole. Myxoma Chorii Multiplex. Mola Hydatidosa.

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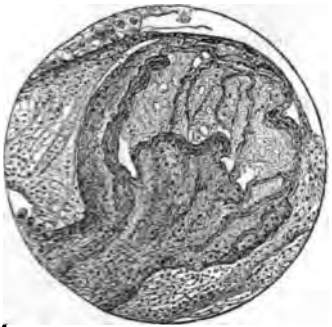
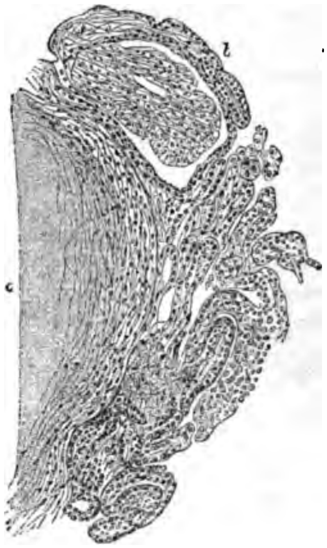
Œdema of the chorionic villi, formerly so called (*H. Meckel*), has been proven by Virchow ("Geschwülste," I, 409) to be a hyperplasia of the mucous tissue normally forming the fundamental structure of the villi, a continuation of Wharton's jelly. Instead of the small hair-like villi visible to the naked eye, and their anastomoses, we find club-shaped swellings of the villi, ranging in size from millet-seeds to grapes, spread either over a part or. the whole surface of the ovum. Hecker (*Klinik*, II, 20) was of the opinion that these degenerations occurred much more frequently than was generally supposed. The substance, which consists of a gelatinous mass—albumin, mucin and lucin having been found in it—containing a small number of cells, assumes throughout the appearance of berry-like cysts filled with fluid, which are seated on moderately thin pedicles. They range in size from that of a hemp-seed to that of a bean or larger, and are arranged like grapes or umbels, fine filaments from single berries being connected with other similar vesicles. The surface of the vesicles exhibits the usual villus epithelium and underneath a delicate layer of spindle or stellate cells which inclose the gelatinous semi-fluid masses, derived from the myxomatous degeneration of the cells (Fig. 74). The vascular system of the vesicles is very delicate or has completely disappeared; the decidua enveloping the berries being all the richer in blood. However, many of these vesicles are also quite vascular, having a bluish-red hue, and are interspersed with blood-clots, which may be large or small. An increase of the fibrous portions of the endochorion sometimes occurs, and produces hard and compact masses in the chorionic villi. These conditions are called *myxoma fibrosum placentæ*. Hydramnios

FIG. 74.



Myxoma of the chorion. A whole villus imbedded in decidua, in myxomatous degeneration, with the vessels in the globular part of the villus.

FIG. 75.



Wall of a larger berry. The contents at the margin consist of a tissue of spindle cells which becomes structureless toward *a*. Another villus (at *b*) is commencing to undergo myxomatous degeneration.

usually exists at the same time. If the degeneration of the villi is complete, the embryo dies and is dissolved in the liquor amnii, so that nothing of it remains. But if the disease is only partial, the fœtus may attain complete maturity and development. Hecker considered the death and dissolution of the embryo to be the primary and the decisive factor, the hyperplasia the secondary one. Virchow, however, justly lays stress upon the fact that the embryo becomes atrophic during the process. Partial myxoma sometimes occurs in the placenta of vigorous children. The size of the hydatiform mole varies from the smallest beginning up to 5 kgm. Great differences may exist in the connections of the villi with the uterine wall; according to Krieger, Volkmann and Waldeyer, the degenerated villi may even grow into the parenchyma of the uterus and the cavernous venous sinuses.

Prominences of the chorion may also be formed toward the amnion, partly by extravasation of blood, partly, perhaps, by a myxoma of the deeper parts of the chorion. *Vesicular gelatino-œdematous prominences* (a partial myxoma of the jelly) may occur *at the umbilical cord.* The partial degeneration of the villi may take place in the placenta alone, or simply in the chorion, or it may be total or partial in either case. I have seen hydatiform moles weighing 1200–3000 gm.

Symptoms.—They are, in the beginning, very slight and unimportant, but when the hyperplasia increases, a *rapid distention of the uterus* takes place. In four to six weeks it may extend up to the scrobiculus cordis; sometimes, however, the uterus remains below the normal size. Hemorrhages, varying in amount according to the vascularity of the villi, are present, so that the patient soon becomes anæmic; the blood either escapes or accumulates in thick layers between the uterus and the ovum. In the latter case the patient soon becomes exsanguinated, without any outward escape of blood. *Pains in the abdomen, swelling of feet and thighs,* of the *external genitals* and the *abdominal wall, severe vomiting, dyspnœa, oppression, exhaustion,* and, at last, abortion are the consequences of this disease. Sometimes the ovum remains in the uterus beyond the usual time. The uterus being often excessively distended, while the muscular structure is defectively developed, the expulsion of the ovum is sometimes delayed for weeks, and may be accompanied by profuse hemorrhage. I may add to the cases of Maier and Depaul (who observed the disease repeatedly in the same patient) a third one from my own observation, in which the patient, 33 years old, within eight years after marriage gave birth to moles four times—blood moles in the first and third, and large hydatiform moles in the second and fourth instances, the latter being expelled in the third month. A remarkable fact in two of my cases was the quick succession of pregnancies. Since the chief anomaly lies in the fundamental structure of the villus, which is formed from the allantois, we might, with Spiegelberg, consider it an anomalous development of the *allantois;* for, as is well known, this closely lines the entire inner surface of the chorion. In the very earliest period of pregnancy a multiple myxoma of the chorion may occur, and affect the entire inner surface. The occurrence of an isolated form of disease of the chorionic villi (said to have been established by the cases of Rokitansky and Winogradow), which would imply that the allantois does not in all cases participate in the formation of myxoma of the chorion, is, however, questionable.

The *diagnosis* is at first impossible. It becomes certain only when the os opens and vesicles are felt; that is to say, for the most part not before labor. The existence of a myxoma becomes probable, if we find that the previously small uterus grows very rapidly within a few weeks (this, however, also occurs in hydramnios). Fluctuation is not felt; the absence of fœtal parts and of cardiac sounds, the great elastic tension of the uterus, the considerable and prolonged but typical bloody discharge, are symptoms which, taken together, greatly strengthen the diagnosis.

Etiology.—As to the cause, little has, as yet, been ascertained; hydatiform mole occurs especially in *multiparæ* and after *chronic catarrh of the mucous membranes of the uterus;* anæmia, weakness, cardiac diseases, severe antecedent sickness predispose to it; it is also sometimes met in gravidæ of advanced age. It is an open question whether syphilis is in any way connected with it; it certainly must be excluded in some cases. One of the cases which I observed was an old prostitute. It may recur in the same patient, as already mentioned.

The *prognosis* is good when the myxoma is partial and the fœtus living; the disease in the placental tissue is sometimes discovered quite accidentally. If the myxoma is *extensive,* the prognosis becomes bad for the fœtus and doubtful for the mother. It depends mainly on the amount of the hemorrhage and the rapidity of expulsion. The completeness of the expulsion of the hydatids also influences the prognosis of the puerperium; after-hemorrhages, sloughing, parametritis and subinvolution sometimes follow. There is no doubt that the villi grow after the death of the fœtus. In twins, sometimes only one chorion is diseased (*Davis* and *Hildebrandt*).

Treatment.—As soon as the existence of a large and rapidly growing hydatiform mole has been established, any attempt to arrest the commencing pains would be useless and, in some cases, hazardous, the object in view in these cases being simply the removal of the foreign body. If no threatening symptoms exist, the progress of labor may be hastened by introducing the colpeurynter into the vagina. But, if there be great exhaustion, dyspnœa and anæmia, abortion must be induced as quickly as possible. This is accomplished by dilatation of the cervix with laminaria or tupelo tents. If vigorous uterine contractions ensue, the expulsion of the myxoma may be left entirely to the uterus; but, if considerable *hemorrhage* occur, *the vagina* should be *firmly tamponed* with *salicylated cotton* until the cervix is sufficiently dilated. If the hemorrhage still continue, an attempt should be made to *express the mole* (*Spiegelberg*, *Gregoric*); if this fail, the mole should be removed from the uterus by hand. Great care should be taken to empty the uterus completely and to avoid perforating its thinned wall. The main body of the mole having been expelled, the remaining portions should be removed with the curette; this, however, sometimes becomes dangerous, owing to portions of the myxoma having penetrated into the uterine wall. The contraction of the uterus immediately after delivery is to be very carefully watched, and any profuse hemorrhage arrested by friction and kneading from without, also by ergot internally or hypodermatically, by ether and cold injections, also by the insertion of tampons with liquor ferri sesquichloridi, and injections of hot water or even perchloride of iron into the uterus. Subsequent hot antiseptic injections into the vagina are advisable for the purpose of rendering the escape of the remnants of the mole harmless to the mother.

CHAPTER IV.

Excess of Liquor Amnii—Hydramnios.

LITERATURE.

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Hydramnios means an excessive accumulation of liquor amnii within the amnion; it may amount to ten times the usual quantity. Werth demonstrated 10–15 litres; Stratton, 16 quarts; Wilson, 7 gallons; in animals it may amount to 135 litres (*Cartwright*). The secretion is slow at the beginning, but increases very rapidly after a few weeks. Physiological and chemical investigations as to the composition of such enormous quantities of liquor amnii do not account for its source. Küstner found 0.07 per cent. of urea in a case of twins. As to the anatomical structure of the amnion in hydramnios, Viti (Siena) found, in one case, the epithelial layer of the amnion intersected with large and small fissures, the sub-epithelial fibres being freely exposed. The protoplasm of the cells was granulated and showed fatty degeneration. In his experiments fluid penetrated uniformly into the fœtal sac, when he injected different kinds of fluids through the arteries or veins into the placenta. With equal pressure and in the same length of time, seven times the quantity of fluid escaped when injected through the veins than through the arteries. Ahlfeld, in many cases, found fissures in the epithelium of the amnion when the quantity of liquor amnii was normal. He considered them to be merely the results of scratching on the part of the fœtus. K. Schroeder found the placenta hypertrophied, together with thickening and tubercular swelling of the villi and hyperplasia of the decidua.

Symptoms.—The uterus is enormously distended by the excessive accumulation of liquor amnii, and up to the end of pregnancy resembles a ball. The results of this over-distention of the uterus are to allow increased freedom of movement to the child, and improper position or presentation, the latter occurring more frequently in hydramnios than in other conditions. Thus, in the last twelve cases, I found 1 breech presentation, 1 occipito-posterior position, 1 prolapsed hand, and 2 in which the head was forced to one side. The fœtus is often imperfectly developed, or is dropsical, exhibiting either anasarca or ascites. The placenta is frequently enlarged, hypertrophied, œdematous, but shows no vesicles or symptoms of partial myxoma; in other cases it is thin and the chorionic villi are swollen. The membranes are either adherent or separated by a gelatinous mass. The umbilical cord is frequently œdematous or very rich in mucous tissue. The extreme distention of the abdomen causes great annoyance from pressure, œdema of the legs and genitals, varices, sharp pain in the sides, dyspnœa and, where it is very great, frequently gives rise to premature labor (50 per cent.). In animals the layers of the abdominal wall sometimes separate, as a result of this excessive distention; this, in turn, results in the formation of large hernial sacs, in which the expanded uterus rests (*Franck*). Delay during the first stage of labor, extreme resistance of the fœtal membranes, a sudden discharge of liquor amnii, rapid expulsion of the child, followed by severe hemorrhage, are frequently met with.

Diagnosis.—The enormous distention of the abdomen, which is tensely elastic, the form of the uterus, its unusually rapid growth, the diminutive size and mobility of those parts of the child which are accessible to touch, afford certain indications of the condition, since in well-marked myxoma no portion of the fœtus can be felt.

Etiology.—The causes, in many respects, are still obscure. It is found to be of a somewhat *chronic origin* in pluriparæ, and especially in those who have borne many times (*McClintock:* 5 primiparæ, 8 pluriparæ, 20 multiparæ; author: 2 primiparæ, 6 pluriparæ and 4 multiparæ); also in anæmic, dropsical, weakly, scrofulous, leukæmic and syphilitic women. One of my patients had disease of the heart, another had croupous pneumonia, a third was insane, but the child weighed 3870 gm., notwithstanding the presence of hydramnios. It is also frequently found in connection with ascites and anasarca of the fœtus and in hereditary syphilis, also with anencephalus and spina bifida which are due to the pressure of water accumulated in the brain and in the spinal cord by the rupture of the coverings. Occasional causes are: syphilis of the lungs and liver in the new-born and peritonitis. It was supposed that fissures extended from the dilated umbilical vein through the cord and its epithelium into the liquor amnii. The disease also recurs in successive pregnancies of the same woman. The following quotations prove the diversity of opinion that prevails among recent authors:—

P. Bar asserts that it cannot be proven that the cutaneous secretion of the fœtus contributes to the formation of the liquor amnii, but that a transudation of liquid constituents might take place when the umbilical vein is congested; the venous branches spreading over the fœtal side of the placenta are simultaneously filled and exosmosis becomes stronger. Bar has failed to find Jungbluth's vessels. He, as well as Leopold and Levison, found a lacunar system of lymph vessels from which the fluid is said to have penetrated through intercellular openings of the epithelial covering. Bar admits the possibility that the amnion may secrete. Fluid may very easily pass from the maternal vessels through the membranes into the cavity of the amnion, and *vice versâ*. He leaves the question of an *increased urinary secretion* as a cause of hydramnios undecided; but does not admit fibrous and fatty degeneration of the placenta and adhesions as causes.

Teuffel found hydramnios to the amount of seven litres in an extra-uterine pregnancy. Truzzi and the author found it in connection with hydrocephalus and velamentous insertion of the umbilical cord and *syphilis*. Meola (Naples) thought that *slowly* increasing dropsy of the ovum was a consequence of disturbances of the circulation in the latter, while the *acute* form in the majority of cases was due to an actual inflammatory process in the membranes.

Sudhoff found an immense round-celled sarcoma of grayish-red color at the coccygeal gland associated with enormous hydramnios. M. Duncan proved the connection of hydramnios with diabetes and found large quantities of sugar in the liquor amnii.

In a case of twin pregnancy observed by Mangiagalli, only one sac was *dropsical;* the two placentæ had no vascular communication; the umbilical cord of the dropsical sac was only 28 cm. long, firmly wound around the trunk and had a velamentous insertion. Nieberding found in two cases premature obliteration of the ductus art. Botalli, together with hypertrophy of the heart, anasarca, enlarged kidney, dilatation of the pelves of the kidneys and uriniferous tubules, also a considerable accumulation of urine in the bladder. He considers the obliteration to be the primary cause.

A. R. Simpson believes that any loss of tone of the muscular structure of the uterus may exercise a very decided influence upon the origin and quantity of the hydramnios. He thinks that in the case of spina bifida with hydramnios it may have been a transudation from the exposed skin.

Hydramnios, in some cases of twins, arises very acutely in about four to six weeks; the amnion of a poorly developed twin containing the lesser quantity of liquor amnii, and that of the other, better nourished twin containing a very large amount. The latter has, at the same time, a hypertrophic heart, large kidneys and serous transudations in its cavities. The variable state of development of the heart and kidneys, which arises, according to Schatz, from the intercalation of the third common circulation at the fœtal surface, is followed by inequality in the quantity of the liquor amnii. In a case of Werth's, however, the fœtus was too small to explain the enormous quantity of liquor amnii, 15–20 litres, by an overproduction on the part of single fœtal organs.

Werth believes, therefore, that the causes of the hydramnios might be due to the fact that the temporary hydræmia of the fœtal blood, aside from the associated endosmosis, is connected with an exudation into the fœtal blood of albumin which carries with it a certain quantity of maternal serum. Hence, if conditions exist which increase the absorption of water by the placental villi to an abnormal degree, a corresponding activity of the organs excreting the excess of water from the fœtal circulation would be followed by an abnormal increase of the liquor amnii. Hydramnios is thus frequently found in connection with an uncommon development of the placenta.

Sallinger is of opinion that the hydramnios is developed by compression of the umbilical vein at the umbilical ring by the dilated urinary bladder.

Küstner finds that the *urinary secretion* is greatly increased in cases of hypertrophy of the heart, owing to a lateral insertion and an invasion of ever-increasing territory by the placenta of a fœtus with a velamentous insertion of the cord, and that the transudation is increased in commencing cirrhosis of the liver from a venous stasis of blood in the portal region.

Both fœtuses may, though very rarely, be polyhydramniotic.

The origin of hydramnios, especially in twins, has not by any means been definitely established. The frequent coincidence of hydramnios in twin births in animal pathology is well known; fœtal kidney diseases are said to give rise to dropsy of the persisting allantois (hydrallantois) or of the amnion (hydramnios), so that hydrallantois was looked upon as a consequence of fœtal diabetes (*Franck*).

The *prognosis* depends on the causes. McClintock lost 4 out of 33 patients of this class by rupture of the uterus, one by infection and two by exhaustion. I lost one (as mentioned before) by preëxisting pneumonia; another was attacked with paracolpitis and parametritis, but recovered. One-third of the children survive, the remainder readily succumb.

Treatment.—In mild cases interference is unnecessary; during labor only the tough membranes are to be ruptured and the normal presentation of the fœtus is to be assisted by a suitable position of the patient. Should the enormous distention of the abdomen cause considerable difficulty, and should the condition increase rapidly and be followed by dyspnœa and orthopnœa, the induction of premature labor is indicated, especially because the fœtus is apt to die in such cases. Puncture of the sac will, of course, be the best method of operation, in which the liquor amnii should be allowed to pass slowly away. Some authors have punctured and emptied the uterus from the abdominal walls, either in order to prevent premature delivery or because of an erroneous diagnosis (for instance, *Kidd:* Trans. Obstet. Soc.,

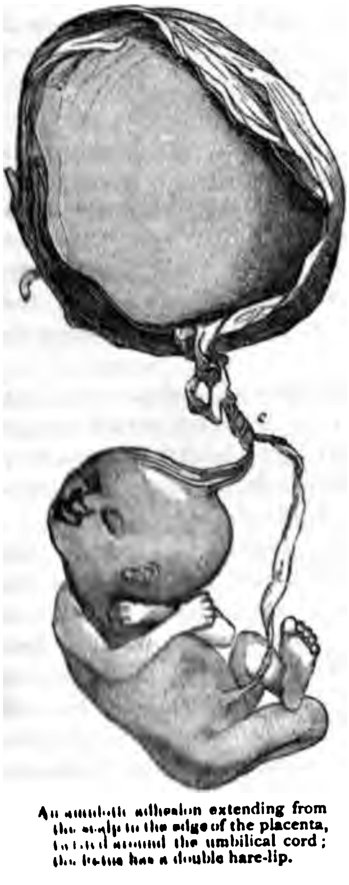
London, 1877–78). Premature labor usually follows this procedı
animals it generally follows within twenty-four hours.

If the expulsion of the fœtus be delayed by weak uterine contr
they must be strengthened by some means; but the forceps should
applied too soon, since considerable hemorrhage may follow part
After the birth of the child, whether spontaneously or artificially, th
should be watched for some time and its contraction stimulated by
hot injections and firm grasping of the fundus.

CHAPTER V.

Abnormally Small Amount of Liquor Amnii—Amniotic Adhesion

FIG. 76.



An amniotic adhesion extending from the scalp to the edge of the placenta, twisted around the umbilical cord; the fœtus has a double hare-lip.

The quantity of liquor amnii ma
normally small, even in the earliest
of pregnancy, so that the separation
amnion from the embryo is delayed
effected only with the formation of
and *bands* of adhesion between it
amnion. These may, by traction, c
tion and compression produce deforn
the child. These *amniotic adhesi*
sometimes thin and cord-like, so
compact, broad and membranous.
mostly found between the extremities
amnion and on the surface only; the
fixations, flexions, curvatures and eve
tations, or, at least, apparent constricti
strangulated portion remaining in a
atrophy on the trunk. Ed. Martin mai
that the extremities could only be con
severed after previous fractures. A
of the amnion may also remain co
with internal organs, such as the bas
brain, or the liver, stomach, spleen a
neys, and thus produce such deforn
hare-lip, cleft palate and hernia
umbilical cord. Deformities of the
are very often met with. If these an
are found without the filaments, it
supposed that the latter have disa
during pregnancy. Such abnormal

tions have also been brought into relation with inflammatory processes. I illustrate a very instructive case of this kind in the adjoining figure (Fig. 76), in which the amniotic adhesion, extending from the child's vertex to the placenta, had become twisted about eight times around the placental third of the umbilical cord (evidently caused by the fœtus turning around the funis), and in which hare-lip, cleft palate and right-sided fissure of the under lip were also found. In animals, too, portions of the fœtus may be amputated by the umbilical cord or by filaments of the amnion; but in them it is of much rarer occurrence than in man. Among the domestic animals the horse is the only one in which they have been observed, and here the umbilical cord is relatively long (*Franck-Goering*).

CHAPTER VI.

Disturbances of Pregnancy due to an Abnormal Situation of the Placenta.

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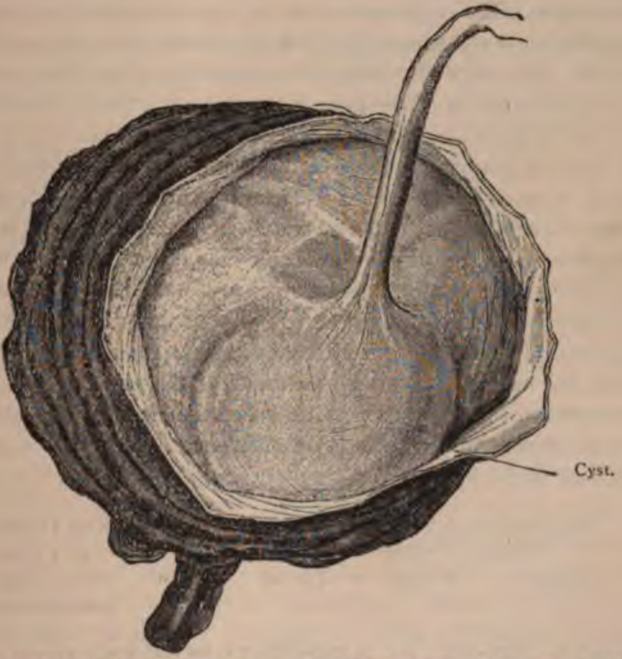
If, in a pregnant woman, the lower edge of the placenta is so close to the internal os that it is torn off in the formation of the lower uterine segment and severe hemorrhage ensues, *the position of the placenta is abnormally low.* If this edge reaches down to the internal os, we call it *placenta prævia marginalis;* if some portion of the placenta covers or covered a part of the os at any time, we term the condition *placenta prævia lateralis,* and call it *placenta prævia centralis* if, even when the os is *almost fully* dilated, the placenta completely occupies the inner orifice. Complete placenta prævia centralis is the rarest (*C. Braun*). A placenta prævia centralis, apparently existing in the beginning of labor, sometimes becomes a placenta prævia lateralis by the tearing away of the smaller lobe. The placenta may also tear at the internal os during pregnancy when the lower uterine segment begins to form; a placenta marginalis (Fig. 77) or placenta prævia succenturiata may arise from this laceration. Cases of this kind were observed by Hecker, Küneke, Schuchardt, Sänger and Spiegelberg. Sänger atrributed it to an endometritis. A serotina-like thickness of the decidua arising from disease of the mucous membrane is said to produce an abnormal attachment of the chorion læve, great expansion of the placental surface and formation of a large accessory placenta, which would be forced to occupy the lower uterine segment, owing to the relative smallness of the surface at the time of its formation.

FIG. 77.



Placenta prævia lateralis lacerata marginata. Cyst of the placenta. May, 1887. Polikl.

H. Bayer's explanation of these changes in a purely mechanical way, by the development of the lower uterine segment, appears to me to be more plausible. He very properly lays stress on the facts that the conditions differ in various cases; that in placenta prævia, the defective development of the found among 519,328 births in Electoral Hesse, 332 cases of placenta prævia = 1 : 1564 births. The 1659 midwifery tables of Saxony, in 1878, give the following figures:—

I.	In the district of Bautzen,	8	cases of placenta prævia in	12,526	cases.
II.	" " " Dresden,	13	" " "	29,293	"
III.	" " " Leipzig,	15	" " "	28,709	"
IV.	" " " Zwickau,	42	" " "	49,025	"
	Total, ...	78	cases in	119,553	= 1 : 1532.

These figures will justify us in concluding that the *frequency of placenta prævia is about 1 in 1500 births, that is, much less than clinical reports seem to indicate.*

The *mode of presentation*—whether marginal, lateral, or central—varies less in the figures of different authors. Thus:—

	Plac. marginalis.		Lateralis.	Centralis.
C. v. Braun found	—	11	—	4
C. Hecker "	5	—	7	1
Hugenberger "	18	—	11	13
Lomer "	—	111	—	25
Winckel, F., "	21	—	33	10
	44	122	51	53

Thus, out of 270 cases, 217 were marginal and lateral and 53 were central.

The *number* of pregnancies exerts great influence in placenta prævia. Of my 61 cases, 14 were primiparæ, 19 pluriparæ and 14 multiparæ. As my cases were mostly clinical, and the proportion of primiparæ to pluriparæ did not differ much, it is evident that placenta prævia occurs two to three times as often in pluriparæ and multiparæ as in primiparæ; according to other authors, likewise, the former were reported to be twice as frequent as otherwise. Enlargement of the cavity of the uterus, relaxation of its wall, catarrh of its mucous membrane which permits the ovum to descend, owing to the destruction of the ciliated epithelium that causes an upward current, and displacements of the organ, may cause placenta prævia in pluriparæ. Pluriparæ and multiparæ who have borne children in *rapid* succession seem to be especially predisposed. Lusk and Parvin state that placenta prævia occurs six times more frequently in multiparæ than in primiparæ. This assertion is apparently based upon L. Müller's figures, who found, among 1574 cases of placenta prævia in various reports, 227 primiparæ and 1347 multiparæ. L. Müller's figures, however, can hardly be relied on, for the reasons given above. King found in the State of Indiana 20 primiparæ and 163 multiparæ, or, in other words, in private practice 1 : 8 instead of 1 : 3.5, *i. e.*, rather more than twice as frequent in multiparæ.

The fact has repeatedly struck me that *pluriparæ*, whose first confinement had taken place in *unusually advanced years*, suffered from placenta prævia as early as their second pregnancy (in one case the woman was 41 years of age, IIpara with placenta prævia; first delivery in the 37th year by forceps, after four days' labor).

Two cases of old primiparæ (29 and 34 years) have also come under my observation.

Spiegelberg maintains that placenta prævia occurs more frequently in poor women than in those in better circumstances, partly on account of the hard work done by the former and partly on account of the frequency of subinvolution in childbed. It has also been asserted that epidemic influences are at fault, and Parvin has given as a reason the performance of coition while standing.(?!)

The cases in which placenta prævia occurred repeatedly in the same patient are especially remarkable. I have treated a patient for placenta prævia who was 32 years old, Xpara, confined every 18 months, who had suffered from placenta prævia as early as the third pregnancy. Ingleby relates two similar cases in which the oviducts opened into the uterus near the internal os; one of these cases was reported to have had placenta prævia 3 times and the other 10 times.

Twin pregnancy also seems to predispose to placenta prævia; among my 62 cases it occurred three times = 4.5 per cent., that is, four times as frequently as elsewhere. Kleinwächter thinks that this complication is not frequent, because he found but 18 such cases recorded in literature. Schuchardt found but one case of twins with placenta prævia in 108,302 births, and Pittock one in 32,000; but this may be accounted for by the fact that such cases are rarely published. The extreme rarity of the cases is improbable when we remember that one author observed three cases in six years, and I saw two in Dresden and one here. It should also be mentioned that uterus *unicornis* and *bicornis* have been found with placenta prævia (*Hohl:* uterus bicornis with twins in the left and right cornu, placenta prævia; *Credé* and *Germann:* uterus bicornis); hence, an imperfect shape of the uterus must also be considered as a predisposing cause of placenta prævia.

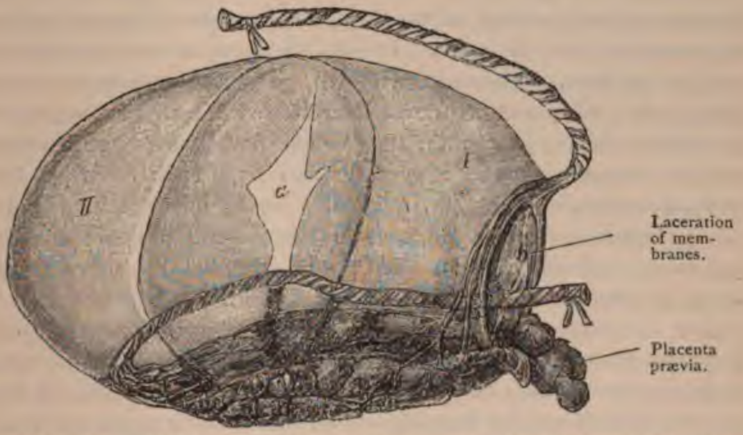
Among my first 16 cases, 6 women had aborted once, others two, three or four times before the labor with placenta prævia; these patients may have become predisposed by enlargement of the uterine cavity, subinvolution and catarrh of that organ.

Hegar has, in addition, established as a cause of placenta prævia, abnormal hypertrophy of the serotina which, as early as the sixth month of gestation, occupied more than half of the periphery of the ovum and extended downward as far as the cervix (Case VIII). I have frequently found *very large placentas*, one of which measured 30 cm. in diameter. In our last case of placenta prævia with twin pregnancy, the placenta was also very large (Fig. 78) and the fact that, in the case of twins, the placenta may reach almost to the os, certainly is often significant. We shall recur to the ordinary shape of the placenta when attached low down.

Spasmodic contraction of the uterus can hardly be assigned as a cause of placenta prævia; and the truth of L. Müller's statement, that placenta prævia owes its origin to an abortion begun at an early period, in which the ovum is retained within the internal os and its villi become attached above, will be difficult to prove, because once an ovum has been completely detached it cannot again become adherent to the uterine walls, even though it should remain in the uterine cavity for some time, and because the embryo dies shortly after being detached.

Chronic catarrhs of the uterus have already been mentioned as predisposing causes of placenta prævia; they enlarge the cavity, render it more slippery and thus may hasten the descent of the ovum. The lower attachment of the ovum may, however, be due to a defective development of the decidua, so that the latter exhibits fewer projections on its inner surface.

FIG. 78.



Placenta prævia lateralis. Unioval twins. Double velamentous insertion. One-fifth natural size. Twins lying one above the other. I, below; II, above. *b*, rupture of fœtal membrane of I between the vessels of the umbilical cord; *a*, rupture of fœtal membrane of II. *Two amnia.*

In one of my cases, it had been necessary to detach the adherent placenta in the preceding labor. In conclusion, I may state that *myoma of the uterus* may also predispose to this complaint. Süsserot found 5 cases of placenta prævia in 147 parturient women with such tumors (*v. Ostertag*, *Tyler Smith*, *Pajot*, *Gussmann* and *Weber*); these were of the submucous and intraparietal varieties and were located near the cervix.

Symptoms.—The first and most important symptom of placenta prævia is the hemorrhage from the uterus, which occurs without any external cause.

berger found in but 2 cases of marginal
three to four weeks before the beginning
days before, and in 7 cases at the onset
observed low implantation of the pla-
only in premature deliveries in the
prævia *lateralis* hemorrhages generally
week, and in the *central* variety between
week. But there are also cases of either
during the first half of pregnancy; these
the very earliest period than is generally
are enumerated as abortions, though caused
of the placenta (see Fig. 67). There
—in which, notwithstanding the exist-
and even centralis, the first hemorrhage
term, and in some instances as late as the
shall cite again, as having come under my
woman, 32 years old, pregnant for the tenth
lateralis twice and was pregnant for the
1864. The first hemorrhage appeared while
of April, 1865. I delivered her by turning
1865, of a living boy weighing 7½ pounds,
inches in length—had become coiled around
; it showed, besides, a *hæmatoma the size*
the umbilical vein.

exceptionally (30 : 136, *Lomer*) caused by
as coughing, lifting, stooping or carrying; it
ten in the middle of the night. Frequently it
beginning, sometimes it appears only in drops;
intervals, after days or weeks, more or less profuse; it
that the women become anæmic, until, finally,
very takes place. According to Hugenberger, to
premature deliveries occur. Lomer found 60 per
with placenta prævia. In my cases I found that
premature, 36 per cent. early and 52 per cent. at term.
by the pains; if separation and laceration of the
as the chorion, the child will die of hemorrhage and
but if the smaller placental lobe become detached it
become flattened and atrophied, and finally sepa-
ment to the membrane; a lower uterine segment may
hemorrhages be absent during labor (*H. Bayer*).

hage occur during the course of labor, the chances are
go on steadily dilating during the pains. Should now
cause a laceration of the cervix, this first hemorrhage

is apt to be unusually severe (*Spiegelberg, H. Bayer*). The undilated portion of the cervix may also show a tendency to become so much constricted that very little, if any, blood will escape during labor. The patients may, however, die of hemorrhage after labor from laceration of the cervix (*H. Bayer*).

The *causes of the hemorrhage* are, therefore, rupture of the utero-placental vessels, laceration of a marginal placental sinus, and detachment of the placenta by shocks or trauma, or by contractions. The bleeding vessels are situated partly, and most frequently, in the uterine wall; partly, when the placenta is lacerated, in the chorion; that is to say, in the fœtal system. J. Simpson considered the vessels at the detached placental surface to be the most frequent if not the sole cause of the hemorrhage. This opinion must of necessity be erroneous, since otherwise the children would bleed to death much more frequently than is actually the case. It is very hard to tell what produces the lesion of the utero-placental vessels in the early months of pregnancy, *i. e.*, so long as dilatation of the cervix is out of the question. It appears to me that a more or less rapid secretion of liquor amnii may be connected with a greater tension of the entire uterine wall and with a dislocation and detachment of isolated placental lobules. The cause of the separation of the placenta from the uterine wall has been ascribed partly to a defective development of the lower portion of the uterus (*Depaul*), partly to excessive growth of the placenta (*R. Barnes*), which extending to the cervical region, where villi cannot find lodgment, also produced the detachment. Others have found the first cause of hemorrhage in the contractions of the uterus (*Spiegelberg*); but this view is hardly compatible with the fact that hemorrhages sometimes appear at a very early stage and occur at regular intervals. *Example:* Patient 22 years old; second pregnancy; 5th day of last menses, Jan. 1st, 1887; from the 9th to the 12th of February there was considerable loss of blood, which again occurred on the 17th to the 21st of March, the 7th to the 13th of April, and the last time on the 15th to the 20th of May, whereupon a five-months' fœtus was prematurely expelled spontaneously, with a *placenta prævia lateralis.*

Another cause of hemorrhage in placenta prævia may be looked for in the frequent abnormal positions of the fœtus and the dragging, displacements and contractions of the uterus often associated with them, during the last months of pregnancy. Charpentier in 1148 cases of placenta prævia found 66 per cent. head, 24 per cent. transverse, and 9 per cent. foot and arm presentations. Lomer found 51 per cent. head, 32 per cent. transverse, 9 per cent. foot and arm presentations. The author found 79 per cent. head, 12 per cent. transverse, 9 per cent. breech presentations (comp. also Simpson, l. c., p. 160). It is obvious that shifting of the head to one side may easily occur, owing to the rounded form of the lower part of the uterus, especially since the uterine wall is more flaccid in many of these multiparæ. To me it appears probable that even in them a certain transverse stretching of the lower part of the uterus may take place, as a consequence of which the placenta becomes detached.

The abnormal attachment of the umbilical cord in placenta prævia may also be a predisposing cause of hemorrhage. Scanzoni, Hugenberger and others frequently found marginal and velamentous insertion of the funis. *Prolapse of the cord* also occurs quite frequently; I observed it four times in 64 cases, which is five times as often as otherwise. An obstruction to the circulation of the placenta—possibly produced by a prolapsed umbilical cord or by its tearing from excessive freedom of movement on the part of the child—may also produce an over-distention of the cotyledons and eventually lead to their detachment.

During labor the placenta becomes gradually loosened by the pains; the muscular structure of the uterus recedes above the placental attachment. Unless the pains are too weak, the parturient will bleed less during the pains than in the intervals (proven by *Legroux* and confirmed by *Spiegelberg*), because the bleeding vessels of the uterine walls and the placenta are compressed during the pains. The flow of blood increases as the pains commence to abate. If the attached surface of the placenta do not wholly cover the os, and if a longitudinal position of the child exist, the latter may, ultimately, slowly advance into the cervix and in this way cause direct compression of the bleeding vessels of the uterine wall, so that the hemorrhage is arrested both during the pains and in the intervals. If the os, when sufficiently dilated, be completely covered by the placenta, the presenting part of the fœtus—the head or pelvis in longitudinal, the shoulder in transverse position —may push forward the projecting part of the placenta; in such a case the expulsion of the placenta before the birth of the child or a *prolapsus placentæ* may occur. Sir J. Simpson has collated 130 cases in which the placenta was either expelled or artificially detached before the delivery of the child; nevertheless, 33 of these children are said to have been born alive.

The amount of the hemorrhage *during labor* differs greatly; even in cases where not a drop of blood had been lost during pregnancy, I have seen such profuse and sudden hemorrhages with the onset of labor in placenta prævia lateralis, that it threatened to be fatal. We have accurately determined the *loss of blood* in our last ten cases and found it to amount to 350–1500 gm. in weight. The *most favorable* termination is *spontaneous delivery*, which, however, takes place only in about 25 per cent. of the cases. The profuse hemorrhage, as a rule, necessitates some operative interference, not only for removal of the child, but also of the placenta. Hugenberger states that this is called for in 25 per cent. of all cases. Fortunately, I have seldom been obliged to remove the placenta by hand after labor, but as one of its margins precedes, the membranes are liable to be torn off, even in spontaneous expulsion, and to remain behind; the placenta follows the child, as a rule, in a very short time, because it becomes displaced, dragged down and detached during the child's advance. We were obliged to express the placenta ten times in our last 16 cases.

The hemorrhage often continues post partum, since lacerations of the os and cervix may bleed considerably, owing to the excessive vascular development of the walls. *Atony of the placental site* may also give rise to after-hemorrhage, which is not surprising when we consider the relaxed and exhausted condition of the uterine wall of multiparæ, especially after the contents of the uterus have been rapidly expelled.

Diagnosis.—Placenta prævia must be suspected whenever, in a pregnant woman in the first or second half of gestation, a large quantity of blood suddenly passes from the genital organs without any apparent cause. If this hemorrhage cease spontaneously, to return in a similar manner after the lapse of a few days, a week or a month, vaginal exploration will then confirm the diagnosis by the demonstration of the succulent condition of the portio vaginalis, the soft and dough-like consistence of the lower uterine segment, and by the discovery, from the strong pulsations, of a pronounced vascular development of these parts. Owing to the patulousness of the internal os, it will be possible to touch the soft and spongy portions of the presenting placenta. Some coagula are usually present in the cervix and a slightly larger quantity of blood than before escapes during the examination. Considerable hemorrhage also occurs during the rapid development of a hydatiform mole, but in this case the duration of pregnancy does not correspond to the size of the uterus; fœtal parts cannot be felt; coagula and a spongy tissue are felt in the open os, together with vesicles, which fact establishes the differential diagnosis. I once mistook the decidua of an extra-uterine pregnancy, which was becoming detached, for placental tissue.

In order to be able to distinguish clearly a central placenta prævia from a lateral, we must not only consider the width of the os, but gently touch everywhere those portions of the placenta which can be felt. We do this for the purpose of discovering the membranes which, being thicker at the margin of the placenta and covered with fibrinous layers, can sometimes be distinguished only with great difficulty. The diagnosis of the child's position per vaginam is often impossible and can only be determined by external examination. Hence, it is easy to understand that many a time the position in placenta prævia has been considered to be transverse, when in fact it was longitudinal.

Prognosis.—It might be generally supposed that the prognosis of the course of parturition would be worse the longer the hemorrhage had continued and the more anæmic the patient had become; but this is not the case. Statistical investigations are said to have proved that the maternal and infantile mortality is greater in full-term than in premature labors. This, however, is not the case according to my own observations. The prognosis differs greatly in private and clinical practice; of 78 cases of placenta prævia treated in 1878, in private houses in Saxony, 38 mothers, or 48.9 per cent., succumbed. The frequent "accouchement forcé" is, in my opinion, the cause, to some extent, of this high rate of mortality. Parvin states that the *maternal* mortality usually amounts to 25 or 30 per cent., and he also remarks that the mortality might be far less if proper assistance could always be quickly obtained. On the other hand, we can obtain far better results by clinical treatment, since, among 178 cases of Lomer, Hofmeier and Behm, which were treated by turning, according to Braxton-Hicks' method, the mortality, which was given as 29 per cent. by J. Simpson and 35 per cent. by Charpentier, has dwindled to 4.5 per cent. In order to turn my own experience to account in this respect, I shall divide the cases into three groups:—

1. 1859–75: Pre-antiseptic period;	19	cases of	placenta	prævia,	5	deaths,	= 26	per cent.
2. 1875–83: Beginning of antisepsis with carbolic acid;	24	"	"	"	4	"	= 17	"
3. 1883–87: Antisepsis with sublimate;	19	"	"	"	1	"	= 5.2	"
	62 cases.				10 deaths.		av., 15.1	"

Ten of these cases occurred in my private practice, with one death; 52 in clinical practice, with nine deaths. My father lost but one puerpera among his 10 private cases. The 19 cases of the last five years, of which but one was treated by Braxton Hicks' method, go far toward proving that this method does not deserve all the credit for the improved prognosis, and we are now justified in saying that the mortality of women suffering from placenta prævia should not exceed 5–10 per cent.

Hemorrhage, as a rule, is the cause of death. Septic infection occurs much more rarely, but was more frequent prior to 1875. Two of my five parturients in that period died of infection transmitted through the lymphatic vessels. Fergusson reports more recently (1885) a case of pyæmia in which blood-poisoning took place after tamponing for several days, followed by operative termination of labor. Another kind of infection—that by the thrombi formed at the placental site, which is situated low down, with subsequent pulmonary emboli or metastases—can only be averted with difficulty. We lost by it the last puerpera, on the eighth day after delivery, which was accomplished by turning and extraction. I also consider the issue in Charles' case of alleged sepsis acutissima, who died one and a half hours post partum, without after-hemorrhage, to be due to fatal hemorrhage or embolism.

The *prognosis for the child* is worse than that for the mother, and is most unfavorable in placenta prævia centralis, because here the hemorrhage begins early, continues for a long time, returns often, and is connected with actual ruptures of the placental tissue, so that the child *bleeds to death*. If the uterine surface of the placenta remain uninjured, or if only a small lobe bleed, and this is compressed by some descending parts of the child, the latter will suffer but little. Operative interference, especially turning and extraction of the child, are, however, so frequent, and are so often performed before there is sufficient preparation of the maternal soft parts, that the child very frequently dies of *suffocation*, as a result of which ecchymoses of the pleura, the pericardium and epicardium, thymus and other organs are found, together with the consequences of premature respiration (aspiration of meconium). To this is added the fact that a large number of the children have less power of resistance, since they are not fully developed; thus about 60 per cent. of the children (*Lomer*) perish at birth in consequence of that anomaly. The loss seldom amounts to less than 50 per cent.; some statistics are as high as 70–75 per cent. Among my last 30 cases, 12, = 40 per cent., were still-born, and 8, = 26.6 per cent., died within the first few days.

Treatment.—The treatment of the hemorrhages which occur during pregnancy in placenta prævia is determined by their duration and amount. Should the hemorrhage be moderate, rest in bed of the patient will be sufficient. Straining of the abdominal muscles should be avoided, hence the stools should be regulated. All articles of clothing which cause pressure should be removed; the patient needs mental rest, fresh air, light nourishment, and must abstain from alcoholic beverages. If the hemorrhage be profuse, vaginal injections of hot water or vinegar (1 : 3 of water) at 118–129° F. should be employed. We may also apply pressure to the lower part of the uterus by a moderately filled colpeurynter, which may be removed when no traces of blood have passed for from 6–12 hours. But the patient must remain in bed for 10–12 hours; she must afterward avoid every exertion and be advised to return to bed whenever hemorrhage recurs. If the patient be pale and likely to faint, she should be invigorated by analeptics (ether), tonics (quinine and iron) and alcoholics (cognac, wine and champagne); quieted by small doses of tincture of opium (five drops two or three times daily), and be given such food as will be best borne by her and will not cause nausea. Mild bitters, and especially liquid food at short intervals and in moderate quantities, may be permitted. Red wine may often be taken in large quantities without any bad effect.

The question whether *premature labor* should be *induced* after a diagnosis of placenta prævia has been made in pregnancy, might appear to be answered in the affirmative according to the statements made above. But this is not the case, because such patients often bear tamponing and colpeurysis of the vagina remarkably well and pains do not ensue. It has been proposed to induce premature labor when the child is viable, and not to hesitate long in urgent cases, as the child's life deserves no consideration in placenta prævia (*Murphy*). But this dogma is not correct in all emergencies. Hemorrhage having ceased under tamponing or colpeurysis of the vagina, these auxiliaries may be removed, and reapplied when the hemorrhage recurs. Premature labor frequently follows in any event. J. Murphy and E. Partridge recommended dilatation of the cervix with Barnes' bags for the induction of premature labor in placenta prævia, while Adams Walther advocated the use of sponge tents, until the os is fully dilated.

As soon as labor has begun, if hemorrhage be considerable and the pains moderate, the membranes should be freely ruptured in order to prevent dragging down of the placenta. This treatment is indicated whenever the membranes may be felt in the os. Rupturing of the membranes for the purpose of controlling the hemorrhage in placenta prævia was advised in 1759 by Puzos, who first dilated the os with his fingers and then ruptured the bag of waters. Auvard states that the results of this method in the Paris Maternity were 13 per cent. mortality for the mothers and 46 per cent. for the children. If hemorrhage still continue, tamponing must be resorted to. Auvard found that, when performed with every antiseptic precaution, tamponing is no more dangerous for the patient than turning, and that a mortality for mothers of 6 per cent. and for children of 48.5 per cent. favored this method, in comparison with that of Braxton Hicks (60 per cent.). Tamponing, he claims, can also be performed more easily than turning and is available during pregnancy as well as during labor. Schatz also considers tamponing of the vagina better than the colpeurynter, because every pain presses the blood from the cervix out of the sponge tents, which then refill.

Parvin (*l. c.*, pp. 319, 320) is correct in saying that Wigand should be credited with having first applied the tampon in this manner in placenta prævia; and also in the statement that this had already been done toward the close of the last century. Wigand himself states that he first described this method in the third number of his "Beiträge," p. 26 (1801), after having employed it with signal success several times. As soon as true labor pains commenced, and often when the discharge of blood was tolerably profuse, he (Wigand) used a tampon; the latter was large, made of soft linen dipped in gruel and thickly sprinkled on its anterior and somewhat broad end with gum arabic and some finely-crushed resin. This was inserted into the vagina and forced up so high that it lay in the os close to the detached surface of the placenta. In order to keep this tampon as firmly as possible at this spot, he plugged the vagina in all directions and in all its recesses with linen or small sponges, as thoroughly as could be done without discomfort to the patient; he then bound a thick, dry cloth firmly upon the external genitals, etc. He says on p. 183: "It must suffice if I assure my readers that I have used this method exclusively for many years and have lost neither a child nor its mother" (*Wigand-Nägele:* "Geburt des Menschen," I, p. 177, §§ 73, 74, 75).

The author also employs cotton tampons almost exclusively in labors complicated with placenta prævia, and they are applied so firmly that not a drop of blood flows from the vulva—a condition rarely attained by the use of the colpeurynter even when filled to the utmost. In placenta prævia centralis and lateralis, tamponing should be continued until the os is almost completely dilated, so that either the presenting fœtal part may enter and plug it, or the compression of the placenta be obtained by introducing the hand and bringing down the breech into the os. This mode of tamponing the vagina for placenta prævia has recently been violently assailed and denounced as unscientific in principle, dangerous in practice, uncertain in controlling the hemorrhage and a prolific source of septicæmia. The method of dilatation by sponge tents has no advantage over it (*Murphy*). These criticisms should be subjected to a rigid examination. If the hemorrhage in placenta prævia springs from the wall of the uterus—whether a lower uterine segment has developed or not—we must endeavor in every case to compress the bleeding vessels by as direct a pressure as possible. This purpose is accomplished by the tampon in an *indirect—not a direct*—and at the same time in a thoroughly scientific manner. The distention of the vagina by the tampons, and the irritation of the ganglia in the upper part of the anterior vaginal wall which they effect, cause an intense desire to bear down and an increased activity of the uterine contractions. Any one can satisfy himself of this fact by examination, after carefully tamponing the vagina during labor. The pains exert not only a partial and direct influence in closing up the bleeding vessels, but the presenting part of the fœtus is also forced against the lower uterine segment by the increased intra-uterine pressure, and thus these vessels are indirectly compressed. By this means the blood is prevented from escaping from the torn vessels between the wall of the uterus and the membranes. We, therefore, increase, on the one hand, the expulsive force of the uterus, and, on the other hand, its power of resistance, and —last but not least—we also prepare the os by this dilatation of the vaginal vault, and render it more yielding in case any operation is called for. This triple purpose is better accomplished, it is true, if the dilatation of the cervical canal can be effected directly and gently by means of a Barnes' bag after the cervix has previously been opened by the fingers. But not every physician has such an instrument with him, and a new rubber dilator should be used for every case of this kind; in the country it is obtained only with difficulty. Shall we allow the hemorrhage to continue during all this time? Certainly not, if a simpler process of compression and dilatation is harmless and quite as efficacious; and this is the case with the tampon. I have never lost a woman by septicæmia after tamponing in placenta prævia. Physicians or midwives usually carry disinfectant remedies (carbolic acid, sublimate) with them, and cotton is found even in the humblest cottage in the country. I consider it important to instruct the patient to apply tampons herself in the event of a return of severe hemorrhage; most of them learn it in a short time. We take salicylated cotton or saturate cotton with sublimate solution (1 : 2000) or dust it with iodoform and introduce it, according to the width of the vagina, in the shape of tampons the size of a walnut up to that of a potato; they may remain in the vagina from 6 to 12 hours; we may, however, frequently be able to remove them after three hours, if the pains have become more powerful, and satisfy ourselves whether operative interference is now feasible. If the time for operating has not arrived, we apply fresh tampons and wait. As above stated, statistics show that by the use of tampons the maternal mortality was only 6 per cent., and that of the children 48.5 per cent.

As soon as the os readily admits one or two fingers, if considerable hemorrhage continues, even after the rupture of the membranes, it will be necessary, in head and transverse presentations, to employ Braxton-Hicks' method of turning upon one foot and drawing it into the os. If the presentation be head or breech, with placenta prævia marginalis or lateralis, and the membranes are sufficiently ruptured and the hemorrhage is slight, we may leave the expulsion of the tampons to the descending parts of the fœtus; we may even leave the bedside of the patient. Extraction by the vertex or breech should be performed only when some danger arises.

If, on the other hand, placenta prævia centralis or lateralis be complicated with a transverse presentation, the patient should, as soon as the condition of the os is satisfactory, be laid on the side corresponding to the free margin of the os or the position of the small parts. If the patient be very anæmic, but not too weak or dying, she should be narcotized. Turning should be immediately followed by extraction if severe hemorrhage persist; if it do not, it will be advisable to wait a while, since the os presents abnormal obstacles to the head. By this means, and by employing tampons at the right time, we may usually wait, despite previous excessive hemorrhage, until the os is sufficiently dilated to permit turning and extracting, and I fully agree with Hugenberger that *accouchement forcé is rarely necessary.*

Manual removal of the afterbirth is necessary only when hemorrhage continues; if it have ceased, the expulsion of the placenta should be left to nature. *After-hemorrhages*—which occur even in an otherwise well-contracted uterus—should be treated with hot or styptic vaginal injections, or by tampons saturated with liquor ferri placed in the cervix, or by bladder tampons filled with ice water, or by the introduction of sponge tents into the uterus (*Jungbluth*). We may also recommend, in post-partum hemorrhage after placenta prævia, grasping the uterus from without and within with the entire hand, and then flexing the cervix and body forward on each other for one-half to three-quarters of an hour (*Breisky, Klotz*).

Transfusion for the purpose of overcoming the anæmia has been abandoned; the injection of blood into the peritoneum alone being still employed. Sometimes auto-transfusion, *i. e.*, bandaging the legs with elastic bandages, and intravenous injection of table-salt (*Schwartz*) have been successfully employed. Injections of large quantities (300–400 gm.) of salt solution (0.6 per cent.) under the skin, and of water into the intestines, are also apt to diminish the anæmia. If vomiting occur occasionally, liquid nutritious diet is indicated: milk, bouillon, yolk of egg; English authors recommend alcohol very highly; opium also does good service. The profuse sweats of the puerperium should be carefully watched.

We have stated above that in placenta prævia the placenta often tears during pregnancy, and that the smaller lobe is loosened or even wholly detached, so that a placenta centralis may change into a lateralis, or even marginalis. Some authors have successfully imitated these natural processes. R. Barnes recommended as a remedy for hemorrhage a circular detachment, with one or two fingers, of the placenta above the internal os, until the membranes are reached; these should be torn and the placenta detached, so that the presenting fœtal part can enter the cervical canal.

Cohen-Credé recommended the forcible introduction of one or two fingers between the uterine wall and the placenta at the point of least resistance, then to rupture the membranes which can be felt, and draw this lobe of the placenta down into the os. Davis has also proposed and adopted a method similar to that of Barnes. Murphy (1885) dilated first with Barnes' dilator and then followed Barnes' mode of treatment, whereby he saved all the mothers and 10 children in 23 cases.

Perforation of the placenta with the hand for the purpose of extracting the child was proposed by Merriman, Gooch and Löwenthal; detachment of the placenta before extraction of the child was advised by Simpson, Churchill and Radford, the delivery being left to nature; Pfeiffer recommended crushing the placenta in order to arrest the hemorrhage. Edwards employed a combination of three methods: in vertex presentations he detached the presenting placenta sufficiently to reach and rupture the membranes. If the os was not sufficiently dilated, he drew down the detached portion of the placenta, compressed it between the fingers or pressed it firmly against the vaginal wall until the os dilated and the head acted as a tampon. The six mothers treated in this way were saved, but only one-third of the children. On the whole, it seems as if partial detachment of the placenta were far more dangerous for the child than the rupture of the membranes alone. The propositions named require additional and more careful examination, since the number of cases given by the respective operators in support of their views is by no means sufficiently large.

The use of ergotin in placenta prævia before and during labor is still sub judice. Auvard used it according to the method of Paul Dubois with very unsatisfactory results, the mortality being 42 per cent. of the mothers and 77 per cent. of the children. E. Wilson had only two fatal cases, a mortality of 6.6 per cent. of the mothers and 26.4 per cent. of the children. He used it before labor for the purpose of exciting strong contractions. Fifteen drops of ergotinum fluidum, three times daily, and ergotin in pills, 0.05–0.1, three times a day, may be administered without hesitation, in my opinion.

CHAPTER VII.

Premature Detachment of the Placenta during Pregnancy, its Site being Normal.

LITERATURE.

Winter, Löhlein, Benicke, Lippmann, Veit and C. Ruge: *Centralblatt f. Gynäkologie*, IX, 106, 1885.

The causes of premature detachment of the normally seated placenta may be the same as in abortion, that is, they may be due in part to the mother and in part to the fœtus. The most frequent causes are external injuries; or diseases of the mother, such as small-pox, typhoid or scarlet fever; violent bodily exertions and movements. Winter attributed the cause, in three cases, to *nephritis*, as did Löhlein; J. Veit observed the detachment as a result of increased arterial tension. Benicke observed it in a gravida affected with morbus Basedowii. I have treated many patients suffering from nephritis who presented no symptoms of internal or external hemorrhage. Of the causes due to the child, we may mention disease or death of the fœtus, rapid and great increase of the liquor amnii (hydramnios), or twin-pregnancy.

The detachment is often slight in the beginning, but the blood effused between the placenta and the uterine wall gradually increases it. Only in those cases in which the detachment begins, not in the middle of the placenta, but at the lower margin, the blood flows downward after loosening the fœtal membranes without further danger to the placental attachment. The most important symptom is the hemorrhage which generally appears soon after some injury. The amount of the hemorrhage is in proportion to the area of placenta which has become detached. It is very rare that the greater part of the placenta becomes completely detached by extravasations of blood without the escape of considerable quantities of blood, and the patient may die from the excessive hemorrhage, before uterine contractions set in or her condition is recognized. Such an accident occurred in the winter of 1862–63 in the Berlin Policlinic, and was demonstrated by Cæsarean section post mortem. We observed another case, in the summer of 1885, resulting from traumatism, of premature detachment of the normally inserted placenta. Intra-uterine hemorrhage may be profuse when the ovisac is relaxed and but little liquor amnii is present; but it is only slight in hydramnios (*Winter*). Rupture of the uterus and placenta prævia may also cause rapid and considerable hemorrhage, but they can hardly be confounded with premature detachment of the placenta. A return of the hemorrhage is usually followed by premature labor; in still rarer cases it ceases entirely and allows the pregnancy to go to term (*Parvin's* case). The uterine wall is uncommonly painful and its tension greatly increased. Frequently the patient is feverish; the external loss of blood may be very slight.

Owing to the intra-uterine hemorrhage, the fœtus dies of suffocation in consequence of the placental detachment. Premature labor generally proceeds like an ordinary parturition; if considerable hemorrhage be still present, it may be arrested by rupturing the membranes. Should this fail, the same internal and external remedies might be used as in placenta prævia. The danger of an *accouchement forcé* would here be decidedly less, and hence, resort to it would be more suitable than in placenta prævia. In our last case, the patient, whose placenta was detached prematurely in consequence of over exertion, was in a state of high fever; the uterus, which was greatly distended, was very tender; still the labor proceeded spontaneously and the puerperium was free from complications. Frequently recent or older coagula are found firmly attached to the outside of the placenta and many more are discharged after its expulsion. As the amount of the hemorrhage depends on the intra-uterine pressure, rupture of the membranes should only be attempted when the labor can be terminated at once; otherwise, the hemorrhage may be held in check by the liquor amnii or by tampons. Goodell collated 106 cases of accidental internal hemorrhage, and found 51 per cent. of them fatal to the mothers and 94 per cent. to the children. In Guy's Hospital, there occurred, according to Galabin, among 23,591 births, 31 cases of this nature, only 21 of which were severe; 5 were fatal to the mothers by hemorrhage, and the mortality of the children was 66 per cent. (*Parvin*).

CHAPTER VIII.

Disturbances of Pregnancy Due to Disease of the Placenta and the Umbilical Cord. Death of the Fœtus. Partus Immaturus and Præmaturus.

LITERATURE.

Oedmannson: *Archiv f. Gynäkol.*, I, 523, 1870. Winckel: "Berichte und Studien," I, 302. Birch-Hirschfeld: "Lehrb. der Pathol. Anatomie," II, 822. Fricker, E.: "Ueber Verschlingungen und Knotenbildungen der Nabelschnur bei Zwillingsfrüchten." Inaug.-Diss. Tübingen, 1870. Maier, R.: *Virchow's Archiv*, XLV.

The diseases of the placenta and umbilical cord are so intimately connected that they cannot be separated. *Disturbances of circulation* are quite frequent in both. Extravasations of blood into the decidua serotina and thence between the villi may occur; but these extravasations may originate in the vessels of the villi themselves. The wedge-shaped or roundish patches of fibrin frequently found in the placenta are partly the result of a *periarteritis fibrosa* (*Ackermann*) and partly due to syphilis (see below). Apoplexy in the villi is rare. The patches consist of hyaline, reticulated or canaliculated fibrin, with obliterated vessels of the villi and condensed villous tissue, whose epithelium has perished. They probably owe their origin to *thromboses* in the blood-spaces between the villi.

According to R. Maier, inflammatory changes in the placenta may be either *diffuse* or *circumscribed.* In the diffuse form, which arises in the connective tissue, the placenta becomes firm and pale. The connective tissue, which contracts after its irritative proliferation, compresses the villi and causes their fatty metamorphosis, occasionally their calcification; the fœtus dies and the placenta may be prematurely detached or become abnormally firmly adherent.

The *circumscribed, tubercular* form of placentitis, originating in the vessels, consists of solid, grayish-white, large or small tubercles which appear round or jagged on section and inclose the narrowed vessel; if the disease be more extensive, the vessels can be distinguished as ramifying threads which are connected with the umbilical artery.

The *syphilitic* changes in the placenta have been described above.

These changes are usually associated with disease of the umbilical cord, which manifests itself, in the first place, as abnormally firm twists or *torsions.* In most of these constrictions the vessels are still permeable, but considerably narrowed; sometimes one, yet rarely all of the vessels will be entirely occluded. Myxœdema is present in one-fifth of all cases, and *thrombi* form in the vessels, the presence of which is recognized even during fœtal life by their compactness and adherence to the respective vascular walls. In the cadaver the thrombus is sometimes very pulpy or friable. The torsions may be few in number and circumscribed, so that for a distance of one or two centimetres the funis, otherwise of normal thickness, suddenly contracts to the size of a crow-quill. In other cases the torsions may be numerous, twenty to fifty or more (see Fig. 65). As the most constant concomitant, the presence of bloody serum in the peritoneal and in both pleural sacs of the child is to be noted; moreover, in more than one-fourth of the cases the spleen is considerably enlarged.

Disease of the umbilical cord, however, is not always associated with abnormal and numerous torsions. Oedmannson and, after him, the author, have demonstrated changes in the vessels of the umbilical cord, which are at least as liable to cause the death of the fœtus as the torsions. I have had this question under observation since my first publication on this subject, and have intrusted my former assistant, Dr. Swiecicki, of Posen, with its further investigation. Among 200 macerated fœtuses in the Dresden Clinic he found 24 cases with a pronounced stenosis of the vessels of the umbilical cord, in connection with cloudiness and thickening of the intima, aside from those cases which exhibited stenosis alone or but slight opacity of the intima. These changes in the vascular wall affected the artery only six times, the vein eighteen times, at different places, sometimes nearer to, sometimes farther from the child; the length of the umbilical cord (20–84 cm.) did not appear to have any influence upon it. Mummified fibrous cords were found in the placenta three times; these represented in part obliterated branches of the vessels or were collected around the vascular ramifications. Pale, compact tubercles were found seven times; some cotyledons were also in a state of fatty degeneration, and yellowish points and stripes in the chorion were present in a few cases. Although syphilis could be positively demonstrated in but six of these 24 cases, yet the remaining ones were quite suspicious; the results of a microscopic examination having been similar to those described by Heubner as syphilitic changes of the cerebral arteries. In one case stenoses existed in both the vein and the arteries. In another case both arteries were so narrowed that even in their course through the abdomen they barely admitted a thick horse-hair.

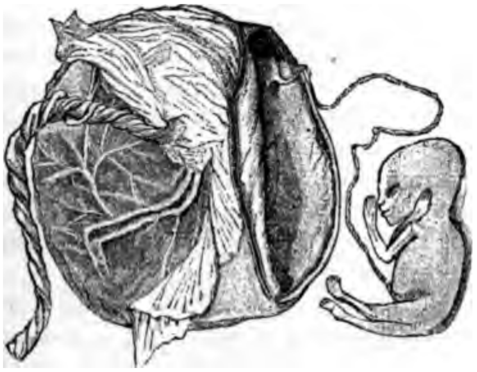
Etiology.—We have stated that *syphilis* is one of the most, if not the most important cause, whose influence cannot always be established in clinics, because the father of the fœtus is rarely seen. The penetration of the other *poisons* (schizomycetes) from the maternal circulation into the placental tissue may, however, in a similar, though less frequent manner, cause these diseases, as in typhoid, cholera, small-pox, scarlet fever, etc.

We have repeatedly spoken of chronic *kidney* and *heart troubles* in pregnant women as causes of these conditions.

Violent shocks to the mother, especially if continued for some time, also may contribute to apoplexies and torsions; this subject has been sufficiently established by Fricker, Tiedemann, Müller and others. In rare instances—this was probably the case in the triple pregnancy observed by us—the motion of one fœtus may cause movement of the others. These anomalies occur in primiparæ as often as in pluriparæ, the preponderance of boys alone being remarkable in torsions of the cord. The fact that in 79.9 per cent. of the cases the seat of the torsion was at the umbilical ring, proves that the motion proceeds from the child; the presence of the most marked torsion at the placental extremity is much rarer (13.4 per cent.), and still rarer that at both ends (6.7 per cent.). Sometimes the torsions are quite uniformly distributed along the entire cord. It is an indisputable fact that an increase of the torsions in a dead fœtus may be caused by the movements of the mother, but surely it cannot be so in all cases nor to such an extent that most of the torsions occur only post mortem. This is illustrated by Fig. 79, representing a *twin placenta with fœtus papyraceus*, in which the umbilical cord of the latter is quite evenly twisted throughout its entire length; although its passive movements after its early death were much impeded, and it was also compressed by the surviving fœtus. The twists were also very close in the funis of the latter.

We must next consider the *diseases of the fœtus* as a cause of unusual motions. These torsions occur more frequently in the second than in the first half of pregnancy; the same holds good in the stenoses of the vessels of the umbilical cord, for the weight of our fœtuses ranged between 780 and 2750 gm. The length of the cord may be shorter than or equal to that of the fœtus, yet in but few cases is it considerably longer. Fig. 79 shows a fœtus papyraceus with double chorion whose flattening is very marked. In such a case, even when the vascular connection at the common placenta is more extensive, but a small amount of nourishment could have been conveyed to the flattened fœtus, on account of marked torsion of the umbilical cord.

FIG. 79.



Twin placenta with fœtus papyraceus and marked torsion of the cord. Double chorion.

Symptoms.—Disturbances of the circulation in the decidua serotina and the placental sinuses, when the placenta is attached low down, readily give rise to *hemorrhages* during pregnancy; as the blood cannot flow out directly, the effusions are not fresh, but brownish and crumbling. They are often associated with *painful contractions* and uncommonly strong and frequent movements of the child. Unless these symptoms disappear soon, a chill sets in and the child's movements may cease entirely. After the fœtus dies, the patient often feels depressed, has disagreeable sweats, the breasts and abdomen diminish in size, the appetite fails, the tongue is coated, headache is present and there is increased sallowness. After a while *labor* sets in, the sac can be felt and the expulsion of the macerated fœtus begins; abnormal presentations, prolapse of the small parts and other anomalies occur much more frequently than in transverse and breech positions. These anomalies, however, are usually of no consequence to the mother. The condition of the fœtus depends upon the length of time it has remained in the uterus after death; it may be of a livid color, or partly covered with bullæ, or be denuded of its epidermis during parturition, either wholly or in part; in the highest degrees of maceration the orbits are empty, the cranial bones are loose, and the funis is reddish-brown and œdematous. Numerous cases of so-called "*missed labor*" sufficiently prove that a fœtus of more than five months may remain in the uterus even for months after its death.

The expulsion of the placenta after delivery did not always ensue at once if the labor occurred at the third, fourth, seventh month—partus immaturus —but *very often not until some days, and in some cases one and one-half to* *three weeks later.* This fact must be emphasized in order to caution against premature artificial removal of the placenta.

If one of the *twins* die during pregnancy, it may be expelled before the other, in case it lies below, and the living fœtus may go to full term. I have observed this occurrence in a gravida at the fourth month, whose mother had also had a similar experience. If the dead fœtus be laterally situated, it is generally compressed by the living one. The liquor amnii of the dead fœtus also diminishes. In the case of unioval twins with copious vascular connections, the continued supply of blood to the dead fœtus prevents its maceration; it becomes almost mummified, and is ultimately expelled during the delivery of the surviving twin in connection with the placenta of the latter, or, what is much more rare, the expulsion follows some little time after. In one of my cases it occurred at the end of twenty-four hours.

Diagnosis.—The death of the fœtus becomes more than probable if some blood escape from the uterus of a hitherto healthy woman; if the cessation of the child's movements—which were distinctly felt before—be followed by chills, faintness, depression, pallor of the countenance; if the abdomen and breasts diminish in size; if the patient very distinctly feels the displacement of the uterus in changing her position; if the vaginal temperature be not lower than that of the cervix, and if milk ooze from the breasts. Auscultation, however, should not be neglected because some of these symptoms may appear while the fœtus is living. The escape of the reddish-brown liquor amnii, the tangible looseness of the cranial bones and the discharge of flakes of epidermis during labor, are reliable symptoms of the death of the fœtus. The presence of certain diseases in the mother, such as broad condylomata, psoriasis and others, or satisfactory evidence of such diseases in the father, will at once throw light upon the changes which are to be expected in the child, the umbilical cord and the placenta. If premature expulsion of the fœtus have ever occurred before, we must apprehend a return of the partus immaturus in a subsequent pregnancy with the least indication of the above-named symptoms.

Treatment.—The prophylactic measures to be resorted to are evident from the causes enumerated; the treatment of premature labor is likewise to be guided by the principles which have been laid down for abortion. The only question to be taken into consideration is, whether, the death of the fœtus having been established with certainty, we had better induce premature labor in order to guard the mother against any injuries which may possibly result from the dead fœtus. This course may be objected to, on the one hand, because the birth of the dead fœtus generally follows spontaneously within a short time, and, on the other hand, because the methods of inducing premature labor, even the introduction of a catheter, are by no means always free from danger. Moreover, women who give birth to a dead fœtus after some days, or even weeks, recover, as a rule, in a short time and experience no further trouble. I have treated hundreds of such cases, and have never been prompted by this indication to induce premature labor. I consider it unnecessary, to say the least.

As to the removal of the placenta, which so often remains behind in such cases, I would caution against too active a proceeding, since nature attends to its expulsion far better than we can do it. The experienced obstetrician knows that he may safely wait for 12–14 days, and that it is ultimately expelled spontaneously, and in a pale, odorless condition.

CHAPTER IX.

Injuries to and Operations upon Pregnant Women.

LITERATURE.

Cohnstein: *Archiv für Gynäkologie*, VI, 320. Faucon, A.: *J. d. sc. méd. de Lille*, 1883, V, 332. Gaulard: *Bull. méd. du nord.* Lille, 1885, XXIV, 1886; XXV, 13, 62, 110. Guelliot: *Bull. et mém. Soc. de chir. de Paris*, 1886, N. S., XII, 337. Gurlt: *Monatsschrift f. Geburtskunde*, IX, 321. Hofmeier: *Deutsche med. Wochenschrift*, XIII, 397, 1887. Mann, M. D.: "Surgical operations on the pelvic organs of pregnant women." Phila., 1883, 8vo. Massot: Paris, 1863. A. Delahaye. Serre: *Gaz. hebdom. de Montpell.*, 1885, VII, 589. Tourmente, J. F.: "Contribution à l'étude de l'influence du traumatisme utérin et périutérin sur la marche de la grossesse." Paris, 1883, 4to. Vulliet: *Archives d'obstet. et de gynécologie*, 11, 1886.

The opinions concerning injuries to and operations upon pregnant women have been rather unfavorable for a long time. Profuse hemorrhage, premature interruption of pregnancy, and septic infection were chiefly feared. Traumata directly affecting the genital organs of gravid women obviously offer stronger grounds for such apprehensions than do those of other organs. It has recently been demonstrated that, under strict antisepsis, surgical operations on the largest scale may be performed even on the genitals without dangerous hemorrhage, without subsequent abortion, and with almost absolute certainty of freedom from septic infection; also that the gravida may be kept anæsthetized during such operations by ether or chloroform for a long time without harm to her or the fœtus. Prior to the introduction of Lister's method of treating wounds, J. Massot had demonstrated by a large amount of material he had collected from the literature—126 cases of injuries outside the genitals and 60 cases directly affecting them—that wounds do not disturb pregnancy, except such as profoundly alter the uterine circulation for a long time or directly affect the contractility of the uterine muscular tissue. Putrid infection is the most dangerous of all complications. If any slowly-acting cause for abortion be present, trauma acts the part of an excitant and hastens it. As to hemorrhages, Massot found that, if moderate, the mother alone suffered, and that pregnancy continued; but if very rapid and profuse, as in rupture of varices (see Fig. 27), the mother died without aborting. If the hemorrhage were profuse but not fatal, uterine contractions set in or the placenta became detached. Among 186 cases with 214 separate injuries, *recovery* occurred 149 times without any incident; in 51 cases *abortion* ensued and proved fatal in 18; *death* followed in 12 cases without abortion (9 by hemorrhage, 1 by collapse, 1 by cholera, and 1 by tetanus).

Cohnstein has also taken up this question (*Archiv*, VI, 320) and ascertained that artificial interruption of pregnancy furnished far more unfavorable results than the performance of the requisite surgical operation, such as aspiration of the ovary, tapping, tracheotomy, aspiration of the bladder, and herniotomy.

I can fully agree with these conclusions, from my own extensive experience. I have performed 4 ovariotomies on pregnant women, all successfully and without directly interrupting pregnancy, although several were very difficult owing to extensive adhesions. In the last case the tumor contained 84 pounds of fluid. In one case the woman was operated upon on the 1st of August, 1879, and was discharged completely cured four weeks afterward; she was delivered prematurely on the 24th of September, 1879, in consequence of inordinate mountain climbing in company with her husband, hence obviously not as a result of the operation.

I have also removed a large sarcoma of the vulva in the fifth month of pregnancy without the occurrence of immature labor. In addition to this I have (without suspecting the presence of pregnancy) performed anterior and posterior colporrhaphy—two very bloody operations—and partial amputation of the hypertrophied cervix in the second month of pregnancy without injury to the mother or child. Therefore, I must say that a loss of blood which even directly affects the uterus may have no injurious effect on it.

I have also extirpated a *polypus* of the mucous membrane the size of a walnut in the sixth month of gestation from a Vpara, aged 42. This patient was delivered on the 13th of August, 107 days later, of a living boy, 51 cm. long and weighing 3420 gm.

Another case is that of a IIIpara, aged 34. On the 21st of December, 1877, in the beginning of the eighth month of pregnancy, the woman was completely anæsthetized; with knife and scissors I removed from the vaginal fornix numerous pointed condylomata which extended over the portio vaginalis. Altogether I removed a mass of tumors nearly the size of an apple and arrested the very severe hemorrhage by tamponing. The patient remained free from fever, was discharged on the 26th of December, and was delivered of a living child at full term. I have twice removed cancroidal degeneration of the portio vaginalis by means of the galvano-caustic loop;

premature labor ensued in only one of the gravidæ. The case of trachelorrhaphy, performed in Vulliet's clinic in the second month of gestation which had not been diagnosticated, may be mentioned in this connection; pregnancy continued to full term and labor was normal.

Still more interesting than the facts hitherto adduced are those cases in which injuries directly affected the *abdomen* of pregnant women, even to such an extent that fractures of and impressions upon the child's skeleton were produced, without causing premature labor or permanent injury to the mother. Gurlt has collated numerous cases; in these the leg had been fractured seven times, the upper arm once, the thigh and upper arm once respectively; one child had a fracture of the clavicle and os humeri on the left side; three had depressions and one a fracture of the skull. In a case of Burdach's ("Beob." 11), the forearm and leg had been broken and had united again at an acute angle before birth. In a case of Gremse-Uhde (*Monatsschrift f. Gebrtsk.*, VIII, p. 22, 1856), a woman in the seventh month of pregnancy fell through a hatchway down on a wagon with racks; she fainted and had great pain in head and abdomen, but recovered in two days and gave birth at full term to a living child with two fractures, one of the left clavicle and one of the humerus, which were united by thick masses of callus.

We could prove by examples that *pregnant women* may suffer extensive bruises and lacerations with subsequent violent pains, and even extensive *burns* on body and vulva without aborting (1881, Nos. 575 and 585).

All these facts lead to the conclusion that even after *direct lesions of the uterus and its contents during pregnancy, premature expulsion of the fœtus does not necessarily follow, indeed, does not usually follow;* also that operations—though they may be postponed if the indication be not urgent—need not be deferred on account of pregnancy, but may be performed with as much success as outside of that condition.

PART V.

PATHOLOGY AND THERAPEUTICS OF LABOR.

In direct connection with the disturbances of pregnancy caused by a defective condition of the fœtal membranes we shall continue with—

SECTION I.

DISTURBANCES OF LABOR ON THE PART OF THE FŒTUS.

CHAPTER I.

Faulty State of the Membranes during Labor.

1. The Immature and Premature Rupture of the Membranes.

LITERATURE.

Valenta: *Monatsschrift f. Geburtskunde*, XXVIII, S. 361. *Archiv f. Gynäk.*, XII, 1.
Hugenberger: *Petersburger Med. Zeitschrift*, N. F., III, 1872.

Under normal conditions the membranes do not rupture until the second stage of labor, that is, some time after the complete dilatation of the os. In many cases, however, the membranes rupture not only *before* the complete dilatation of the os, but even at the onset of labor and, in some cases, before the pains commence; we call the last-mentioned rupture of the membranes *premature*, and that at the commencement of labor, *immature*. Extensive statistical observations by Hugenberger and Valenta have recently demonstrated that the dangers and injuries generally assumed to be caused by premature rupture of the membranes did not in reality exist; but if we group together all the cases in which the accident occurred before and with the onset of the labor-pains, up to the time when the width of the os is about 3 cm., we obtain somewhat different results.

Etiology.—Among 2627 labors in the Dresden Clinic (Jan., 1875, to Oct., 1877), the rupture of the membranes occurred:

I. At the end of the stage of dilatation,	693 times	= 26.4 per cent.
II. During the stage of expulsion,	651 "	= 24.8 "
III. *Artificially* during the stage of expulsion,	407 "	= 15.4 "
IV. Immaturely,	713 "	= 27.1 "
V. With the os 3 cm. wide,	163 "	= 6.2 "

that is, altogether too early in 33.3 per cent. of all cases.

This last figure considerably exceeds those of Hugenberger (18.3–20 per cent.) and Valenta (24.2 per cent.).

Premature rupture of the membranes is said to occur very rarely in animals if the labor be left to nature, and to be caused mainly by improper interference. Primiparæ and multiparæ show no essential difference in regard to this anomaly (27.9 : 26.3 per cent.). This agrees pretty closely with the statements of Valenta and Hugenberger, while Spiegelberg regards primiparæ as particularly predisposed.

The influence of repeated pregnancy is more distinctly shown in that premature rupture of the membranes occurred in: Ip. in 27.9 per cent.; IIp.–IVp. in 25.9 per cent.; VIp.–VIIIp. in 25.4 per cent.; but VIIIp.–XIVp. in 31.6 per cent. This increase in multiparæ is confirmed by Hugenberger's figures. The influence of the age of the parturient is also interesting. Valenta admits this influence only in so far that old primiparæ are disposed to it on account of the peculiar firmness of their parturient canal, and that in young pluriparæ the activity of the expulsive forces is apt to be excessive. But our experience shows plainly, in accordance with Hugenberger's tables, an increase of premature ruptures of the membranes with advancing age.

	YEARS.				
	15–20.	21–25.	26–30.	30–35.	35–40.
Primiparæ,	23.7%	27.3%	35.8%	44.2%	—
Plp. and mp.	10.3%	25.6%	26.1%	27.9%	33.3%

The influence of age appears, therefore, to be especially effective in primiparæ.

Any increase of intra-abdominal pressure, such as lifting heavy loads, a fall, violent physical shocks, a strong cough, stooping, etc., may be instrumental in causing rupture of the membranes before the beginning of labor.

There is no doubt that a predisposition may be created by the abnormal thinness and pliability of the fœtal membranes. A premature escape of the waters in consequence of examinations by the touch in clinics may often be observed in primiparæ and multiparæ (29 : 33.3 per cent.); more frequently in the latter than in the former, because the internal os admits the finger, and thus the fœtal membranes may be scratched directly. Poppel's and Duncan's investigations show that too great importance should not be attached to the physical condition of the membranes, the moment of escape of the waters being by no means proportionate to the given resistance of the fœtal membranes.

Both investigators demonstrated the occurrence of timely rupture in spite of moderate power of resistance, while tender and delicate membranes sometimes had to be ruptured during parturition.

Hugenberger mentions as additional predisposing factors abnormities of the soft parts, passive tension and dilatation of the uterus, delayed engagement of the presenting fœtal part in the pelvis, and anomalous uterine contractions. We have before stated that old primiparæ are especially prone to premature rupture of the membranes, owing to the unyielding character of their parturient canal, while young primiparæ, whose parts are still soft and distensible, are very rarely affected with a premature escape of the liquor amnii. Hugenberger and Valenta assert that rigidity and firmness of the os, by opposing considerable resistance to the advancing ovum, are almost always a cause of premature rupture of the membranes, but our observations have not borne out these statements.

Cervical endometritis, especially the gonorrhœal form, may lead to softening, maceration, erosion, and destruction of the fœtal membranes. Thus we found that, in patients suffering from profuse leucorrhœa, premature rupture of the membranes occurred 1½ times as frequently as in cases free from this affection. The fact that this affection causes the cervical canal to open sooner than usual may contribute to that effect, in primiparæ.

Twin-labors and hydramnios present ample opportunities for the investigation of the causal relation between dilatation and tension of the uterus on the one hand and premature rupture of the membranes on the other. Among 25 cases of twin-labor under our care, premature escape of the waters occurred 13 times—52 per cent.,—while in 25 cases of hydramnios it occurred only 5 times—20 per cent. The delayed engagement of the presenting fœtal part in the pelvis is a still more important cause of the premature escape of the waters. We observed it in 42 per cent. of *narrow pelves*, which agrees with Hugenberger's figures. But the cases of premature rupture of the membranes, with particularly strong children, were decidedly less numerous than those of Hugenberger. This difference may be accounted for by the greater thickness of the membranes when the fœtuses are larger, and, partly, by the fact that they fill the cervical canal more completely, and hence protect the portion of the liquor amnii which lies in front of the presenting part against the increased intra-uterine pressure by shutting it off from the upper portion, so that the bag of waters is less compressed; while the membranes are more likely to be torn when the bag is exposed to the entire uterine pressure, owing to the high position of the presenting part and the free communication of the contents of the bag of waters with the uterine cavity. For the same reason, premature rupture of the membranes should be more frequent in unfavorable positions and presentations of the child than in normal ones. The following table shows this to be true. Among

2534 head	presentations	680	were connected	with prematurely	ruptured	membranes,	26.8%
61 pelvic	"	25	"	"	"	"	41. %
18 facial	"	6	"	"	"	"	33.3%
10 transverse	"	1	"	"	"	"	10. %
4 brow	"	2	"	"	"	"	50. %

The result is, therefore, a total of 34 in 93 faulty presentations, or at the rate of 36.5 per cent. against 26.8 per cent. in vertex presentations. We are also able to confirm the interesting fact pointed out by Hugenberger, that the *second presentations of the child are rather more exposed to the danger of premature rupture of the membranes* than the first (I—26.2 per cent.; II—28.3 per cent.). This fact, and the premature rupture of the membranes in unfavorable presentations of the child, seems to me also to be connected with *unequal traction*, by the fixation of the fœtal membranes, for instance, in brow and face presentations on the side of the occiput.

Opinions still differ greatly as to the influence of the uterine contractions upon the premature and immature escape of the waters. Hugenberger ascribes this influence to feeble and excessively strong pains. Valenta attributes it to the latter, but not to the former. Bidder believes, because artificial rupture of the membranes often succeeds in regulating colicky pains, that they have no influence upon the premature escape of the waters. According to our observations, the cause of this accident cannot be attributed to feeble contractions; yet premature rupture of the membranes is likely to mak so-called abortive pains steady, that is to say, to allow the uterus to reacte more quickly and easily to irritations. Only in primiparous cases do inefficient pains in the expulsive stage become noticeably more frequent after premature rupture of the membranes—a result which corresponds with what Hugenberger claims to have observed in all stages of labor. As to the other anamalous pains and their connection with premature rupture of the membranes we refer to what follows.

Symptoms.—The dilatation of the cervical canal and the os uteri is not effected as gently and evenly by the presenting parts of the child as it is by the membranes. We must, therefore, look *à priori* for greater painfulness of the contractions in premature rupture of the membranes. In fact, almost one-half of the parturient women who require the administration of chloral hydrate or morphine to make the excessive pains bearable are affected with premature rupture of the membranes (44 per cent.). It may be added that premature escape of the waters was present in 66 out of 158 parturients in whom incarceration of the lower uterine segment was associated with an anomalous distribution of blood in the peritoneal investment, a tumor on one or both cervical lips, and intensely painful uterine contractions. This proves that the accident must be a marked causative factor of cramp-like pains.

As to the *duration* of the several stages of labor after premature and immature rupture of the membranes, it is said by Hugenberger that parturition is delayed two hours in primiparæ and one hour in pluriparæ. This is not exactly the case according to our experience.

Of 1005 labors in *primiparæ* we found the average duration to be 20 hours and 23 minutes, and in 892 *pluriparæ* 12 hours and 30 minutes. Of 387 labors in primiparæ with premature and immature rupture of the membranes, the average duration was only 19 hours and 6 minutes, and of 319 labors in pluriparæ with the same anomaly, 11 hours 28 minutes.

Hence *the premature rupture of the membranes shortened the labor.* Premature rupture of the membranes in animals, however, is generally to be considered as a sign of protracted labor (*Franck*).

The stage of dilatation, in primiparæ as in pluriparæ, corresponds to the entire duration of labor; retardation of the second stage of labor is so rare in primiparæ and pluriparæ with premature and immature rupture of the membranes (7 and 6 per cent.) that evidently there is no causal connection between them. There is, however, some difference, according as the rupture of the membranes occurs before or at the onset of labor, or else some time after it. Valenta concluded from his experience that very early rupture of the membranes was a symptom indicating a very protracted labor, but we found that it hastened the delivery chiefly when labor passed without the coöperation of the bag of waters; but when the rupture occurred after the onset of uterine contractions the duration of parturition could be expected to exceed 20 hours in half of the primiparous cases, whilst in *pluriparæ* the premature rupture seemed to make no difference.

We find, especially in primiparæ, that very rapid or protracted labors, with premature or immature rupture of the membranes, are often followed by anomalous after-hemorrhages. The proportion of hemorrhages in primiparæ after timely rupture of the membranes to that in similar patients after premature rupture is as 15.1 per cent. : 19.4 per cent.; the proportion in pluriparæ being as 17.3 per cent. : 18 per cent.

If the liquor amnii escape not only prematurely or immaturely, but also in great quantities and with a certain force, it may carry with it some of the *small parts of the fœtus or the cord*, if there be room alongside the presenting part of the child. But cases of a faulty attitude of the fœtus, with premature discharge of liquor amnii, are not more frequent than those in which the membranes rupture at the proper time, hence the discharge of the former could not have been very rapid, as through an empty os uteri, and the occurrence must depend on the varying predisposition. Hugenberger claims that prolapse of the cord, with premature escape of the waters during labor, was four times as frequent as in normal conditions. Our experience, however, does not agree with his, because in our cases of contracted pelvis, faulty presentation of the child and hydramnios, the membranes remained intact for a much longer period. That the premature rupture of the membranes may have a deleterious influence upon mother and child, despite the shortening of the labor, is evident by the fact established by us, that both manual and instrumental operations had to be performed much more frequently in such cases than otherwise (instrumental labor being in the proportion of 3.9 per cent. : 6.3 per cent.).

It is self-evident that the child must suffer by greater constriction, by direct, strong and uneven compression of its presenting part, and, should the umbilical cord become involved, by the uneven distribution of blood through its internal organs, as well as by the compression and premature detachment of the placenta. Valenta found the child's life more than ordinarily jeopardized both during labor and during the first nine days after birth. Hugenberger demonstrated in his cases only a preponderance of still-births above the average; but the results of our observations have been as follows:—

	AFTER TIMELY RUPTURE OF THE MEMBRANES.	AFTER PREMATURE RUPTURE OF THE MEMBRANES.
Asphyxiated and *resuscitated*, ...	196 = 10.2 per cent;	100 = 14 per cent.
Still-born or *not resuscitated*, ...	42 = 2.2 "	35 = 4.9 "
Died after birth, ...	67 = 3.5 "	91 = 2.6 "

We see, therefore, that asphyxia and still-births were twice as frequent after premature or immature rupture of the membranes; and the same is true of the children who could be resuscitated; on the other hand, the rate of mortality in the first days of the child's life was not increased. The injurious effect of premature escape of the liquor amnii upon the mothers can be easily proved; the rate of mortality in this class of parturients was 2.6 per cent., just twice as high as in the rest. But these observations were made at a time when antiseptics had just been introduced, which fact, doubtless, to some extent, accounts for the high rate of mortality, especially of pluriparæ. Endometritis, lochiometra, ulcers of the vagina, parametritis and even peritonitis were often observed in them.

We must now make special mention of some of the causes of premature and immature rupture of the membranes; we have stated before that gonororrhœal cervical endometritis is one of the most frequent causes of lesions of the fœtal membranes. We must also ascribe to the same cause anomalous labor pains which frequently occur, as well as the prolongation of the first stage of labor; furthermore, there is reason to believe that it gives rise to the ulceration of cervical lacerations in the puerperium and to inflammatory processes in the parametrium. These cases, therefore, must be taken separately if we wish to determine the significance of premature or immature rupture of the membranes by itself. Cases are on record which prove that, even when endometritis coexists with premature discharge of the liquor amnii, parturition and childbed may be normal. Such instances, however, are rare and are counterbalanced by the numerous cases in which the escape of the waters is premature while the genitals are perfectly healthy, and in which, despite the rapid course of the labor (as, for instance, in old primiparæ), the patient suffers immediately after delivery a considerable loss of blood, has slight fever in childbed (102.2° F.), and when discharged shows an endometritis evidently acquired sub partu. *Vomiting* often occurs during the uncommonly painful contractions. In general, when endometritis is absent, the temperature of the patients is not higher than it is in cases in which the membranes rupture at the proper time ("Klin. Beob. z. P. d. Geb.").

The conclusion we arrive at is, that no particularly desirable effect is to be noted from the more rapid expulsion of the child, which frequently occurs after premature rupture of the membranes, although it obviates one danger: the *entrance of air into the cavity.* We shall discuss this subject in greater detail in another place. Before proceeding, however, we would state in this connection that, when the pains are feeble and the child is still movable, any hasty or sudden movement of the parturient may cause the aspiration of a considerable quantity of air into the uterus, which may lead to decomposition of the ovum by microphytes, distention of the uterus by the development of gases, thus injuriously affecting the activity of the uterine contractions, and may cause death by being forced into the gaping vessels of the uterus, when stronger pains cause the latter to close down more firmly on the child.

Treatment.—In order to limit the premature escape of liquor amnii, the patient should be directed to lie down, especially if the presenting part of the child be still movable, even if no pains be present. If the flow have been copious and the cervical canal be very firm, the further escape of the liquor amnii may be prevented, the cervix be prepared for labor and the uterine contractions stimulated by the insertion of a moderately distended colpeurynter, which must be changed at least twice a day and an injection of sublimate (1 : 2000) be given after each removal. A proper position of the parturient to aid the mechanism of labor, avoidance of too frequent examination and the regular emptying of the bladder and rectum are indispensable. The mitigation of excessively severe pains by sinapisms to the back or abdomen, by enemata of chloral hydrate (gm. 1 : water 50), warm poultices, or by 8 to 10 drops of tinctura thebaica is indicated. *Painting with cocaine* during the escape of the liquor amnii is unreliable. Nitrous oxide gas with oxygen does good service.

When the genitals are very dry, the so-called *partus siccus*, we may administer lubricating injections of linseed tea, althæa tea or milk, or introduce several litres of a weak solution (0.6 per cent.) of sodium chloride into the uterus. In delayed labors of this kind, warm, full baths may be recommended in the first stage.

2. *Excessive Resistance of the Fœtal Membranes.*

Great toughness of the fœtal membranes may impede labor. They may fail to break, because they are pressed on all sides by the presenting part into the cervix, or because the liquor amnii is insufficient in amount; moreover, the water shut off by the presenting part pressing on the cervix, being no longer subject to pressure, may render the advance of the fœtal parts impossible; or else the fœtal membranes are dragged far down and thus detach the part of the placenta nearest the internal os, thus giving rise to considerable hemorrhage. Where the liquor amnii is abundant and the membranes are elastic, the bag of waters projects from the vulva. When the liquor amnii is moderate in amount, the entire child may be delivered in the fœtal membranes; the ovum may, therefore, be expelled intact at the end of pregnancy. Unless help be quickly at hand, the child will suffocate in the liquor amnii. The uncommonly protracted and severe exertions on the part of the uterus may bring about a rise of temperature sub partu, as I have demonstrated in a case ("Kl. Beob. z. P. d. Geburt.," p. 243). As in the case of abortions and premature labor, not all of the fœtal membranes offer this abnormal resistance; the decidua circumflexa usually, and the chorion very frequently, retracts; hence the amnion alone remains, and, in fact, is the only one capable of changing from the circular into a conical form, because it is readily detached from the placental surface and the rest of the chorion, and frequently possesses considerable power of resistance.

Diagnosis.—One would think that the ovisac of a child could hardly be mistaken for any other tumor; but I have seen a physician mistake the highly œdematous scrotum of a child for the membranes of a second fœtus; and in our clinic in 1887 the very flaccid sac of a hydrocephalus, which had become macerated and entered the external genitals, was mistaken, not only during life but also at the autopsy, for the presenting portion of the fœtal membranes. It should also be taken into consideration that, even after a rupture of the membranes together with the discharge of a considerable quantity of fluid (Spiegelberg, 150 gm.), a second bag, formed exclusively by the amnion, may appear and must be ruptured.

Treatment.—Rupturing the membranes, which is the only indication in the cases under discussion, should not be done too soon, lest the liquor amnii escape too rapidly. The opening is to be made at the lowest point with the finger nail or a disinfected *knitting needle*, or a stylet or similar instruments, so that the finger may enter the aperture and allow the waters to escape uniformly and enlarge the aperture, according to the size of the presenting part. Special instruments, such as the *amniotome* recently devised by Wenck (*Ill. ärztl. Polytechnik*, 1885, Heft 3), are not needed. If the fœtus be expelled in the unbroken membranes, the sac can be quickly opened with umbilical scissors sufficiently far to permit the removal of the child. If the membranes be ruptured artificially, care must be taken to avoid any vessels which can be felt within, lest they be injured and cause a loss of blood that may be fatal to the child.

CHAPTER II.

Anomalies of Labor Due to a Faulty Condition of the Umbilical Cord.

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(1) Faulty Form and Vascular Arrangement of the Umbilical Cord.

Very few of the anomalies under this head cause disturbances of labor. Hyrtl distinguished the following: (*a*) The vessels divide at the distance of 5–10 cm. from the placenta or abdominal end. (*b*) One vein and one artery are found instead of one vein and two arteries; Hyrtl has found this abnormity eight times in healthy and well-developed boys. In a mature female fœtus weighing 2750 gm., which died in consequence of velamentous insertion and coiling of the cord (51 cm. long) around its neck, I found only one artery (right arteria umbilicalis) which formed the direct continuation of the abdominal aorta, and from its lower end the crural and the hypogastric arteries issued separately. Hyrtl also mentions cases reported by Mayer, Rathke, Osiander, Busch, Friedmann, and Späth, in which the anomaly was associated either with hemicephalus, anencephalus, or hydrocephalus, three being females. Or two veins and one artery may be found; cases of this kind have been reported by Arantius, Kerkring, and Trew. This condition is sometimes merely indicated by a separation of the vein, which speedily reunites; such divisions are very rare. Th. Bartholin and Nortwyck mention bifurcated and trifurcated umbilical veins. According to Hyrtl, a double umbilical vein along the entire cord up to the umbilicus occurs only in ruminants.

We sometimes find *three arteries and one vein.* Wrisberg found in a placenta divided into seven lobes the umbilical cord splitting into seven branches, each of which contained one artery and one vein; one artery dividing into three and another into four branches; the vein sprang from seven similar branches. (*c*) In a single fœtus, the *funis is divided from the navel of the child*, and thus proceeds apparently as a double cord to a single or divided placenta. As far as I am aware, Scanzoni is the only author who has seen this anomaly; he found the two arteries to be in the one fold and the vein in the other; he was of the opinion that this condition might agree with older statements concerning fœtuses with several umbilical cords. Cases of communication of divided umbilical cords by transverse cords have likewise been observed; Staalpaart von der Wyl (*Klob*: "Path. d. w. Sexual-org.," 1864, p. 563) found a triple cord in twins, each of whom had its own umbilical cord and placenta, and a third joined these two together. Klob adds that the communicating branches of the umbilical vessels which run superficially and often ascend in a fold of the amnion in cases of double placenta might be considered as the rudiment of this anomaly. So far as I know, this malformation is the only anomaly which might give rise to disturbance of labor or the death of one or both children, inasmuch as the advance of the lower child might cause a rupture of the connection between the cords and injure both.

In cases of twins, a fusion of both umbilical cords into one, at some distance from the placenta, is a very rare occurrence. Thus, in a case observed by Reynolds, the cords of twins were fused 13 cm. from the placenta; while one artery and one vein were found in each of the two cords, in the single common end-piece but one artery and one vein were found; the artery divided 2 cm. and the vein 4.5 cm. above the bifurcation. Such an occurrence may prove fatal to the second child by hemorrhage from the vessels of the divided cord, in case the twin pregnancy had not been discovered and the cord of the first child had not been doubly ligated. In many cases there is a marked difference in the size of the two umbilical arteries; in rare cases one artery appears considerably larger, almost *aneurismal*, the the other being normal. K. Froriep found in a boy, eight lunar months old, who had died four days after birth, the right artery to be of the thickness of a raven's quill, the left being normal.

(2) Abnormal Insertion of the Umbilical Cord.

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(*a*) The insertion of the umbilical cord is faulty when it fails to reach the margin of the placenta and is inserted into the membranes: velamentous insertion. In 11,000 births I found this anomaly 90 times—0.82 per cent. Chiari and Cornelius observed it only 40 times in 8000 births—0.5 per cent. It occurs as frequently in primiparæ as in pluriparæ. Transverse presentations are ten times and pelvic presentations four times as frequent with it as in other cases; Steinlooh also calls attention to the frequency of pelvic presentations. The transverse distance of the insertion from the placental margin, according to Hueter, was as follows:—

18 times less than 3 cm.
2 " " " 8 "
1 time " " 10 " and
1 " " " 15 "

In our cases it was—

10 times, 1–4 cm. from the margin.
6 " 5–10 " " " "
4 " 12–16 " " " "

Hueter thinks that the distance is not likely to exceed 15 cm. Hecker, however, once found it to be 23 cm.

The *causes* of the velamentous insertion are to be sought in the invagination of the allantois at a point of the chorion not corresponding to the decidua vera (serotina), at which the villi afterward atrophy. Hegar is of the opinion that the umbilical cord is not completely formed, whenever the vessels lying close to and in connection with the chorion prevent the complete envelopment of the amnion. In this condition the position of the umbilical vesicle and its duct must remain the original one; however, since this duct cannot be completely inclosed in an amniotic fold, the position of both the umbilical vesicle and the velamentous insertion are consequences of the same developmental anomaly. According to B. S. Schultze, it is chiefly an anomalous state of the umbilical vesicle and its duct which, by forming adhesions with amnion or chorion, must lead to velamentous insertion, if the growth of the duct does not keep pace with that of the amnion. In like manner the development of a placenta succenturiata and also an arrest of development of the amnion may produce this anomaly.

The velamentous insertion is mostly near the margin of the placenta, in which case the two arteries unite, in two-thirds of the cases, into a common trunk (*Hyrtl;* see Figs. 5 and 17). It is worthy of note that, where the insertion is not far from the margin, the vessels, especially the venous branches, do not pass in a straight line, but generally in a devious course and to distant points of the placenta. In one of our cases, one of the branches was but 5 cm. long and the other 17 cm. The displacement of the insertion upon the chorion may also reach as far as the pole of the ovum opposite to the placenta. Hyrtl states that, in that event, short umbilical cords are regularly found which at the most have four spiral turns (see the beautiful illustration in Hyrtl, Plate VI). It is also significant that velamentous insertion occurs very frequently with *twin and triplet placentæ*, in which cases, according to my observations, it is eight times as frequent as in other conditions; see, also, Hueter, Hyrtl, Scanzoni, Ahlfeld and Thivenot.

Moreover, it is an interesting fact that *both* twins very often exhibit a velamentous insertion of the cord (comp. Fig. 29), even when both amnion and chorion are double at the septum common to both fœtal sacs. In a case of this kind observed by us, the one cord was inserted 15 cm. and the other 6 cm. from the margin of its placenta at the septum. In a triple birth observed by us, two umbilical cords had a velamentous and one a marginal insertion within one chorion and one amnion. Hyrtl found a velamentous insertion in every one of five triplet placentæ. Concerning the length of the cord, he says that it varied as much with velamentous insertion as in other cases; but that short cords with at most four spiral turns were found only in cases where they were at a great distance from the margin of the placenta. This statement does not quite agree with our experience; for we found them 43–50 cm. long when the insertion was 16 and 20 cm. distant from the margin. In two cases we found a length of 92 cm.; in one of 80 cm.; in four of 67; in one of 66; in one of 61½; and in 23, less than 50 cm.; coiling of the funis around the neck was not more frequent than usual (25 per cent.). We met, however, with some cases of short cord associated with velamentous insertion (No. 3, 38 cm.; No. 6, 33 cm.; in the case of *triple birth* the two velamentously inserted cords were only 13 and 19 cm. long; the one marginally inserted was 31 cm. long). The nutrition of the fœtus does not necessarily suffer even when the umbilical cord is inserted far from the margin of the placenta; this was shown in one of our cases in which this distance amounted to 10 cm., and the boy was 54.5 cm. long and weighed 3960 gm. Among 50 children, 3, or 6 per cent., were macerated—a number which is more than double the normal. It should also be stated that one of these 50 children—a fully developed boy, born cyanotic but alive—discharged meconium from mouth and nose at the end of the first day and died 43½ hours after birth, of aspiration-pneumonia of the lower pulmonary lobe. This child had a ring-shaped atresia of the œsophagus, the lower end of which communicated with the trachea. As to the *sex* of the children, our cases were 30 females, 20 males; a remarkable preponderance of the former. This proportion was also given by Hyrtl, but was not confirmed by our subsequent observations at Munich (comp. *Roelig*). Subperitoneal myoma of the uterine wall existed in one of our cases (No. 16). In this case the child was completely developed, and even had reached a weight of 4000 gm., so that the uterine cavity must have been roomy; but the facts that the child took a breech position and also that the placenta had to be artificially detached indicate the existence of an anomaly in the wall and shape of the organ.

The shape and other qualities of the placenta are likewise remarkable in velamentous insertion of the funis, because irregularities are frequently found in connection with it. The placenta may, indeed, be large, thick and heavy, even when the fœtus is small; in fact, in the case of the boy mentioned before, who weighed 3960 gm., the placenta weighed 830 gm. Very frequently the placenta is heart-shaped, divided, hemispherical, or horse-shoe-shaped; several times we found it bean-shaped in twins. Hugenberger observed velamentous insertion three times in nine cases of placenta prævia.

As regards the *etiology of velamentous insertion*, in the light of the facts above stated we feel justified in assuming three possibilities: 1. The *primary development of the allantois* may be *remarkably short, i. e.*, too short to be able to reach as far as the decidua serotina; in support of this view we have the extreme shortness of the cord and the absence of an umbilical artery in some cases. It must then be inferred that the fœtal vessels, having reached the chorion, develop sub-amniotically until they reach the placenta (partly by a large curve). 2. The attachment and connection of the allantois with the chorion at the decidua vera is effected by a faulty state of the umbilical vesicle (see *Hegar* and *Schultze*). 3. The union is prevented by the presence of a second *fœtus* in the uterus. According to Ahlfeld, the velamentous insertion depends also on the position of the abdominal surface of the embryo with reference to the inner surface of the ovum, because in the case of twins this surface is turned toward the septum and the umbilical vesicle meets with an obstruction between the layers of the amnion, which speedily coalesce; or, if there be but one fœtus, and the vitelline duct is very strong and resisting, it may fail to yield to the pressure of the amniotic sac. 4. *A faulty shape or condition of the uterine walls* does not permit the attachment of the allantois at the point where the ovum has lodged; this cause is rendered probable by the frequency of breech and oblique presentations, of placenta prævia, and of uterine myoma. We, therefore, ascribe the causes partly to primary defects of development and partly to mechanical impediments.

Symptoms.—Velamentous insertion may become dangerous to the fœtus during pregnancy by causing its atrophy, since it cannot obtain sufficient nourishment from the less vascular circumflexa. The smaller the distance of the insertion is from the villi connected with the serotina, the easier becomes the vascular communication, and it may reach an extent sufficient to convey to the embryo the material required for its nutrition.

Hegar has reported a few cases in which the velamentous insertion caused the death of the embryo and abortion; the large percentage of premature labors in our cases (58 per cent.) was, perhaps, due in part to the faulty insertion of the umbilical cord.

Velamentous insertion does not always affect *parturition* injuriously; but it must be admitted that abnormal presentations occur more frequently in connection with it than ordinarily, viz., 80 per cent. vertex, the rest being face, breech and transverse presentations (comp. Inaug. Dissert., Roelig, Munich). Among 61 cases of Busch and Cornelius, 11 children were stillborn, two of them in consequence of compression of the umbilical vessels by some part of the child; there were 18 per cent. of still-births in 32 cases at Marburg.

Chiari, Braun and Späth observed sudden death of a fœtus from inter-meningeal apoplexy, presumably caused by compression of the vessels of the cord which were inserted near the laceration of the membranes. Among our 50 cases in Dresden, 20 were fully developed, 25 premature, and 8 immature. Of 26 cases in Munich (see *Roelig*), 27.5 per cent. were not fully developed, and four, or 20 per cent., of the full-term children succumbed, two from velamentous insertion exclusively, two in consequence of a simultaneous prolapse of the cord. Of the first two cases, in one fœtus the cord was coiled around the neck, while the other one was a breech presentation, weighed 4000 gm. and had to be extracted. My student, Mrs. Dr. T. Mironoff, has published a very instructive case in which the danger to the child was averted by the use of the forceps at the right moment. If the point of insertion is found near the os uteri, *presentation and prolapse of the cord* may follow. Cases of this kind have been reported by Meyer, Chiari, Braun, Späth and Hohl (see Fig. 78). Hyrtl mentioned a case from Braun's clinic in which the cord was inserted six inches from the margin and had prolapsed, although it was only 10½ inches long; the child died, owing to imperfect reposition. This kind of prolapse is especially dangerous to the child, either because reposition fails, or because the prolapse recurs with the advance of the child. I have observed two such cases (Mironoff, No. 2, S. 5 and No. 14, S. 12). Prolapse of the hand took place in the first case, followed by prolapse of the cord after reposition of the former; in the second case the cord prolapsed with the rupture of the membranes. Both cases were complicated with contracted pelvis. In the former the insertion was 12, in the latter only 3 cm. from the margin. Thus, the frequency of prolapse of the cord amounted to 4 per cent. in velamentous insertion, while in other cases the prolapse amounted to only 1.04 per cent. The vessels of the cord may sometimes be felt during parturition in the segment of the membranes surrounded by the os uteri. Similar cases have been reported by Ricker, Hueter, O. Ruge and Hecker. Moreover, the insertion of the umbilical cord may be found in that part of the fœtal membranes which first appears at the os uteri and cause a presentation and prolapse of the vessels of the cord and of the cord itself. Hueter observed a rare case of this nature: he succeeded in saving the child by rupturing the membranes and using the forceps, while in all other cases (of Ricker, Hecker, Naegele and Ahlfeld) the child died of hemorrhage sub partu, caused partly by a rupture of the umbilical artery (case of C. Ch. Hueter), partly owing to an injured *venous branch* (cases of Benkiser, Ricker and Ahlfeld). Such a rupture of the vessels of the cord in cases of velamentous insertion occurs also where the point of insertion is more remote from the os uteri, as, for instance, in the case of Meyer, before mentioned; also in a case of Chiari (*Klinik*, S. 85). The death of the children in such cases will not always be due to anæmia. The child may have been in deadly peril before the rupture, owing to pressure upon the vessels, and sometimes, with an anæmic state, the fact of premature respiration may be established. For, even before the rupture of the membranes the circulation is impeded in the portion which has passed through the os. The respective vessels are compressed during the descent of the child's parts, even before the membranes rupture.

Diagnosis.—The velamentous insertion can be ascertained during labor only when the point of insertion has prolapsed and when pulsating and immovable vessels are felt in the fœtal membranes. The diagnosis becomes *probable* when, with the rupture of the membranes without demonstrably low attachment of the placenta and without any lesions of the vagina and uterus, considerable hemorrhage appears, while the fœtal heart-sounds become fainter or inaudible. The discharge of meconium will soon follow under these circumstances. Intra-uterine compression of the cord will be diagnosticated from the characteristic change in the fœtal heart-sounds: their rapid diminution during the pains and their return and very considerable increase after them; but, as a rule, the velamentous insertion will not be recognized as the cause of this phenomenon until the labor is terminated. We found an umbilical murmur only four times in 50 cases of velamentous insertion.

The *prognosis*, on the whole, is favorable for the mother, no delay in delivery being caused; but the parturient is exposed to danger on account of the operations which are necessary to save the child's life. The child's life is always jeopardized when the insertion is near the os uteri; only two children, in whom the insertion was near or even above the os, were saved.

Treatment.—If the vessels of the cord be found in the protruding segment, it is advisable, in order to prevent their rupture during the pains, to puncture the membranes laterally, with a needle, at the same time avoiding the vessels. Ricker proposed double ligation of a ruptured vessel with an aneurism needle, but this could be done only in rare cases, because the point of injury can be ascertained only with great difficulty during labor. Besides, a ligature is unnecessary when the hemorrhage is moderate, especially when it subsides with the descent of the head. The labor must be terminated by artificial aid—whether the hemorrhage be considerable or not—whenever the fœtal heart-sounds have fallen to 100 during and between the pains.

(*b*) *A bifurcated insertion of the funis* is also a rare anomaly—found only three times by Hyrtl—the umbilical cord being inserted centrally or eccentrically by two diverging branches. In one case of this kind, one branch contained only the umbilical vein and the artery; the space between the bifurcation is always closed by a transparent septum of the amnion. The bifurcated insertion is of no practical importance, except in twin cases, which has been considered above.

(3) Abnormal Length and Knotting of the Umbilical Cord.

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In 62 per cent. of all cases the length of the umbilical cord amounts to 40–60 cm.; it is longer in 30 per cent. The greatest length I have observed was 109 cm. Neugebauer found a cord of 67¾ inches = 163 cm. Schneider found one of 72 inches = 192 cm. Kohlschütter's statement that Wrisberg had found cords 70–80 inches long could not be verified by Hyrtl. The longest cord found by Hyrtl measured 56 inches = 148 cm. Dezeimeris found a cord 20 inches long in a fœtus four months old (*Klob*, p. 562). Schmidt does not consider it improbable that the size of the child depends on the length of the cord—a fact generally demonstrable in twins; the larger child usually has the longer cord. Abnormal length of the umbilical cord predisposes to its coiling around fœtal parts, its presentation and prolapse, also to its intra-uterine compression and obstruction of the circulation. Churchill found the cord coiled around the child in 52 cases among 190 deliveries; none of the cords measured less than 18 inches; where the cord was coiled twice, none were below 24 inches, and in cases of triple coils, none were below 36 inches in length. There are, however, a number of recorded cases in which the coiled cord was not as long as stated by Churchill in his cases. It was only 34 inches long in a case which occurred in Göttingen in 1839, where it was coiled six times around the child (*Neue Zeitschrift*, XIII, 2). In a case of Nütten it was firmly coiled around the neck three times, but measured only 18 inches (*Schmidt's Jahrb.*, XLIII, 44). In a case of Credé it measured only 19 inches, though it was coiled eight times (*Monatssch. f. Geburtskunde*, I, 33). An excessively long cord predisposes, furthermore, to actual *knotting*, inasmuch as it is liable to form loops through which the fœtus may slip. This occurs in 0.4–1.5 per cent. The main conditions requisite for the formation of a true knot are: first, a cord which in length exceeds twice the distance from the umbilicus to the vertex; secondly, a small child, or a large quantity of liquor amnii; that is, great mobility of the child; moreover, the loop, when the head enters it from above, must be so situated that the fœtal passes under the placental extremity; the reverse must occur when the head enters the loop from below. In breech presentations, the fœtal must pass underneath the placental end if a true knot is to be formed by the breech slipping through the loop; the cord may even be proportionately short; in such a case the knot can only be completed during delivery. The umbilical cord of most of the higher animals is shorter than that of man; in horses, its length, as compared to that of the body, is as 1 : 1.8; in cattle, as 1 : 4.3; in sheep and goats, as 1 : 5.8; in dogs, as 1 : 2.4. This accounts for the absence of true knots in animals (*Franck*).

The knots formed during pregnancy may easily be distinguished from those originating during labor. The former are more firmly tied, small, have less of Wharton's jelly, which may even be entirely absent on the concave surfaces of the sharp curvatures. When such a knot is untied, its place is distinctly visible on the cord, since the several curves in the knot cannot be straightened out. Knots formed during labor are easily loosened, and when united show no trace (*Hyrtl*, p. 53). If the fœtus passes twice through the same loop, the knot is said to be double-tied (Plate III, Fig. 4 in *Hyrtl*), which condition must be carefully distinguished from a *double knot*. Sometimes a fresh true knot is formed, during labor, alongside of an old knot which existed during pregnancy. Hyrtl records two instances (p. 54). This new knot may either inclose the old one or be separated from it by a piece of cord.

The earlier a knot is formed, and the more firmly it is tied, the more apt it will be to disturb the circulation and become dangerous, or even fatal to the child. Of 16 true knots of the cord observed by me, three were also associated with coiling of the funis around the child; 15 of these children became viable; one was born asphyxiated, but revived; in ten cases the cord was 50–60 cm. long; in five cases 60–98 cm.; once only, less than 40 cm. We must, therefore, conclude that, even where true knots exist, the umbilical cord is not longer than usual in nearly two-thirds of the cases. An instance of the probably sudden formation of a knot which quickly endangered the life of the child has been observed by A. F. Hannay. A IIIpara, 28 years of age, felt violent movements of the child after stooping suddenly; the child was still-born; its cord had a very firm, hard knot in the centre, at which point the funis was but half as thick as elsewhere. I have observed a case in which the child perished on account of a true knot which had probably formed very rapidly. The mother, who was suffering from secondary syphilis, had previously lost several children in the same way.

The vein, which is thinner and more superficial, appears to be first compressed; its placental end, therefore, often shows varicose dilatations, and the placenta appears interspersed with recent and old apoplexies.

More important for the process of labor is—

(4) The Too Short Umbilical Cord.

LITERATURE.

Beebe: *Obst. Gaz.*, Cincin., 1883, VI, 61. Credé and Germann: "Bericht über die Leipziger Poliklinik," 1849–59, p. 57. Dyrenfurth: "Inversio uteri durch zu kurzen Nabelstrang." *Centralbl. f. Gynäkol.*, Leipzig, 1885, IX, 801. Harvey: *Med. Rec.*, New York, 1886, XXX, 376. Herman: *Med. Times and Gaz.*, London, 1884, II, 573. Kales: *Amer. Journ. of Obstetr.*, New York, 1886, XIX, 1245. King: "Tr. Amer. Gynec. Society," 1886, New York, 1887, XI, 485. Sclafer: *Gaz. des hôp.*, No. 106, 1855. Wright: *Obstetr. Gaz.*, Cincin., VI, 125.

There are some cases in which the funis may be said to be *entirely absent*, so that a real cord had not formed, but the fœtus was connected directly with the placenta in such a manner that the fœtal vessels passed immediately into the latter. This anomaly has been repeatedly observed in hernia umbilicalis funiculi, as, for instance, in a case of Hausen (*Schmidt's Jahrbuch*, IV, 318), and it may occur not only in a single fœtus but also in twins. Virchow reported such a case to the Obstetrical Society of Berlin in 1863.

One of the most interesting cases is the one observed by Credé-Germann ("Bericht von 1849–59," p. 57) in the Leipzig Poliklinik, in which the umbilical cord was entirely absent. The umbilical vessels were inserted—owing to a defect of the anterior abdominal wall, which consisted only of the peritoneum—directly into the margin of the placenta, which was centrally attached; the feet of the child were flexed over the back; the vertebral column was arched backward; the child was between seven and eight months old.

Hyrtl also mentions cases of Sampson, Mende and Otto. Stegmann reported a funis six fingers' breadth in length; F. Hildanus, one a span long; Meissner, one five inches long; the shortest one measured by Hyrtl was nine inches long. Sclafer saw one 10 mm. long, which is probably the shortest one ever measured. Generally speaking, we understand that a cord which is said to be unusally short is one whose length does not equal the greatest distance, during labor, between the fœtal umbilicus and the point of insertion of the funis in the placenta when still connected with the uterus (*Kohlschütter, l. c.*, p. 204). This length may, therefore, differ greatly according to the point of insertion of the umbilical cord in the uterus. If, for instance, this point is near the fundus, the cord may be too short even though it be 35 cm. long and not coiled around the child; that is to say, under these circumstances the cord may sustain such powerful traction during labor that both mother and child will suffer. When we consider that the length of the uterus at the end of pregnancy amounts to 35 cm., and that the crouching fœtus measures about 25 cm. from the head to the umbilical cord, the funis, if inserted close to the internal os, must clearly be at least 60 cm. long, if, in vertex presentations, the expulsion of the fœtus is to take place without injury to either. But if the insertion is higher up, or if the cord is shorter than 20 cm., such an abnormal shortness will necessarily be productive of fatal disturbances of labor, among which are: premature detachment of the placenta with external and internal hemorrhage; very painful and rapidly recurring contractions; great tension of the cord, together with compression of the child's vessels and eventually their rupture; delayed expulsion of the child; and sometimes inversion or even prolapse of the uterus. All of these consequences have actually occurred, and can be illustrated by carefully observed cases from the literature. Moreover, it is not improbable that an excessively short cord may *cause breech presentations*, if the point of insertion is too near to the internal os. In Sclafer's case labor was delayed by the slow descent of the head, which had to be extracted with the forceps, and was followed by rupture of the cord. Hausen had a case of profuse hemorrhage resulting from traction on the placenta, owing to an almost complete absence of the cord; the latter was torn off at the same time. In my "Klinische Beobachtungen" (pp. 216, 217) I have related a case in which the death of the fœtus during labor was caused by a cord which, though only 29 cm. long, was coiled around the child; a slight discharge of blood from the genitals about a week before delivery was probably due to the same cause; in addition, the contractions were intensely painful, and the temperature rose steadily (from 99.7° to 101.5° F.), owing to the abnormal muscular activity resulting from traction on the cord. Cases of Steinberger, C. Mayer, Wardlewarth, Dyrenfurth and others prove that inversion may be produced by an abnormally short funis.

But few statistics as to the *frequency* of short cords are available. De La Motte has not mentioned a single case of this kind in his collection of remarkable cases of labor, and Zeller states that he has never observed one. Peu ("Traité des Acc.," 1694, Part II, Cap. I, § 5, p. 286), among 4000–5000 labors, cites only four cases of cords short enough to cause dystocia. Among 630 labors my father found seven cases with short cords, three of which ruptured sub partu. Of these seven children (one case of twins) three were born in *breech presentation*. In two of his cases the impediment to delivery was very evident.

The consequences resulting from an abnormally short cord may also be produced by such cords as have become relatively *too short by being coiled around the child.*

(5) **Shortening of the Cord by Coiling.**

LITERATURE.

Besson: *Obst. Gaz.*, Cincin., 1886, IX, 113. Duncan, M.: Transact. Obst. Soc., 1881, 203. Fränkel: *Centralbl. f. Gynäk.*, 1883, VII, 33–37. Grey: *Lancet*, Sept., 1853. Haake: *Monatsschrift f. Geburtskunde*, XXVI, 319. Hohl: *Neue Zeitschrift für Geburtskunde*, XV. Humphreys, F. R. (Diagnosis): *Brit. Med. Journal*, London, 1886, II, 860. Kales: *Amer. J. Obst.*, 1886, 1245, New York. Napier: *Edinb. M. J.*, 1882–83, XXVIII, 984 and Trans. Obst. Soc., VIII, 26–32; 41. Rachel: *Amer. J. of Obst.*, 1886, Sept., 918. Schatz, F.: Tageblatt der Deutschen Naturforschervers. in Strassburg, 1884, LVII, 348–350 and *Deutsche med. Wochenschr.*, XXV, 158. Veit: *Monatsschrift f. Geburtsk.*, XIX, 290. Winckel: "Klin. Beobachtungen zur Pathologie der Geburt," Rostock, 1869, p. 215 and "Berichte," I, 294, 295.

Veit estimates the frequency of coiled cord to be 1 : 4.5; but according to my observations it is somewhat higher, viz., 1 : 4.35. These figures refer merely to coiling around the neck; but there is no doubt that coiling around the trunk and extremities occurs oftener than we see it, because such coils may easily be stripped off during the passage of the child through the soft parts (see Fig. 69). This statement is confirmed by the fact that meconium is often found in the liquor amnii in the absence of any other cause, and, in addition, an umbilical murmur is often heard when the funis is not coiled around the neck of the child. According to Weidemann, coiling around the neck was found 3230 times in 3379 cases of coiled cord = 1 : 1.4 or 96 per cent.; 149 around other parts = 1 : 22.67 or 4 per cent.; 2546 were single coils = 76 per cent.; 684 multiple = 24 per cent. Among 2930 children, 18 were still-born owing to coiled cord = 0.6 per cent. Of 1217 cases of coiled cord 31 were still-born = 2.5 per cent. Grey found the cord coiled nine times around a child which was born asphyxiated but revived. I observed five coils, the cord being 109 cm. long. Coiling around the neck becomes dangerous when the cord is dragged on too much and thus compressed, or when the pressure is exerted against the anterior pelvic wall by the descent of the child. Nearly one per cent. of all children perish by compression of the cord coiled around the neck. The danger is greater in primiparæ, whose genitals are narrower, than in pluriparæ, and greater with boys than with girls (40 : 23 according to Veit's figures). This danger arises mainly from compression of the vessels of the cord, rather than from strangulation; for in most cases the coil is single and leaves the anterior half of the neck free, where the large veins descend. Strangulation of the vessels of the neck may contribute to the death of the child only where the coils are multiple and firm. In Nütten's case (mentioned above) of triple coiling of a cord 18 inches long, which showed a *mark of strangulation*, the breadth of a finger, bluish-red, flat and glistening, there was no extravasation of blood in the subcutaneous tissue. The mechanism of labor is sometimes affected by coiling of the cord. As Kohl has explained, the engagement of the head in the pelvic inlet as well as the presentation of the child, may be changed from vertex into a face or transverse. If the cord passes upward in front from the neck, the rotation of the head around its perpendicular diameter, and that of the shoulder after the expulsion of the head, may be prevented.

M. Duncan has pointed out that, when the cord is very short, the front surface of the child, after the birth of the head, rotates upward, the cord lying close to the urethra and forming a radius around which the body turns in a manner similar to that in so-called spontaneous development in shoulder presentation. This hindrance may also occur in pelvic presentations when the cord is coiled around the child.

D'Outrelepont (*N. Z.*, XIV) goes decidedly too far when he asserts that of ten stillborn children, three always perish by absolute or relative shortening of the cord, produced by being coiled around the child.

Moreover, coiling of the cord may cause hemorrhage, premature detachment or laceration of the placenta, rise of temperature, rupture of the funis, inversion or prolapse of the uterus (cases of Borham and Bockenthal), in the same way as an absolutely short cord.

The *diagnosis* of an abnormally short cord is generally difficult and often impossible; for all the symptoms recently enumerated by Rachel, Leith, Napier, Matthews Duncan, and Schatz as characteristic of it may lead to error. Devilliers states that violent movements of the child which subsequently become weaker, or even feeble movements continued for some length of time before delivery, point to absolutely or relatively short umbilical cord; but such abnormal movements also occur shortly before the child's death if due to other causes. A slow labor, a sudden arrest of the contractions, sometimes local pain at the placental site, and most commonly general tenderness of the uterus and tension of the organ during the pauses, are said to be also indications. L. Napier called attention to insufficient, followed by excessive flexion, together with weakness of the pains and a certain irregularity of the contractions. Schatz makes a statement which is of value in the diagnosis of this anomaly, namely: that when the prolapsed cord is compressed, 12–14 pulsations occur at first with normal frequency, then they suddenly sink to one-half; and after the compression has ceased, the former frequency will reappear, but only after six or seven further beats. He observed the same phenomenon repeatedly in a parturient around whose child the cord was coiled twice. Schatz declared (on the strength of Aubert's experiments with animals) that this slowing took place most probably without the coöperation of the vagi, through the direct influence of the non-oxygenated blood on the heart, or the centres situated in it. The only way of ascertaining the coiling of the cord *sub partu*—that is, before the birth of the head—is that given by Haake. One or two fingers are to be inserted into the rectum and advanced as far as the child's neck, where the cord may be supposed to be. The diagnosis is generally established after the expulsion of the head. The frequent recession of the head during the pause, which is due to the elasticity of the external genitals and that of the head, together with considerable flow of blood and unusually painful contractions, prompted me at times to diagnosticate absolutely or relatively short cord, but I was often mistaken. An important sign pointing to intra-uterine compression or dragging on the cord is the umbilical murmur. This, indeed, points to obstruction of the circulation only, but does not indicate its nature. J. W. Kales claims to have noticed a perceptible depression of the fundus during a forceps extraction in a 17-year-old primipara; the cord, 18 inches long, being coiled twice around the neck and the placenta attached at the fundus; all other signs were wanting; the child was cyanotic, but soon revived.

Etiology.—Predisposing factors are: great length of the cord, abundance of liquor amnii, moderate size of the child, yielding uterine walls in pluriparæ, marginal and also velamentous insertion (Winckel: "Berichte und Studien," III, 57–61). The most important exciting causes are the well-known changes of position of the child and their immediate and remote causes. It is certain that diseases of the child, especially hereditary syphilis, if associated with an abnormal abundance of liquor amnii, will often give rise to multiple coiling and knotting of the cord. Sometimes *very strange entanglements* occur, which can be accounted for only by jerky and hasty movements of the child, or may suggest a crouching and more convulsively involved position of the latter. I have illustrated a remarkable case of this kind ("Berichte," I, p. 294). Stein described a case (comp. Kohlschütter, p. 187, illustration), in which the cord had become so much entangled around the body and extremities of the child that not a hand'sbreadth of free surface remained. Laar's case is still more wonderful; here the arms of the four-months-old fœtus had been tied, as it were, on the back; and Daubert's case (*suicide* of the child in utero), in which the neck had been drawn back on to the vertebral column by four coils of the cord; this constituted a special cause for a faulty attitude. See also the case of Osiander, which was diagnosticated before delivery (comp. *Kohlschütter*).

Prognosis.—An absolutely or relatively short cord may cause the death of the fœtus before the onset of the pains, by being abnormally stretched or compressed. Careful examinations of aborted fœtuses show that this cause of death is not rare. The prognosis is generally good so far as the mother is concerned; the hemorrhages arising from traction on the placenta are rarely dangerous to her; the anomalous pains and the delay in the expulsion are not very serious. *Inversion of the uterus*, however, jeopardizes her life; it may be caused by strong and sudden traction upon the absolutely or relatively short cord, hence in precipitate or rapid labors. But all the predisposing factors which contribute to acute inversion of the uterus do not seem to concur often, since I have not observed a single instance among 50 cases of rupture of the cord, and 6 additional cases of a strong traction on the coiled funis associated with precipitate labor. Some complications render the prognosis worse for mother and child; these are: faulty attitude of the child, contiguity of the small parts to the head and neck; also, as stated above, face presentations, which cause compression of the funis and delay the process of labor.

Treatment.—If we could positively diagnosticate absolutely or relatively short cord during labor, we might, perhaps, in some cases change the presentation of the child by placing the parturient in a proper position and thus prevent dragging on the coiled cord. But since at most a probable diagnosis is made, and even this only in rare cases, we cannot institute treatment until after the head is born. The steady fall in the number and force of the child's cardiac sounds will, of course, impel us to terminate the delivery as soon as possible. A. M. Sherry's advice, not to use the forceps in this emergency, but if possible to express the fœtus, should be borne in mind. I have already indicated the mode of procedure in cases of coiled cord after the birth of the head. W. Smith (*Froriep's Notizen*, XVIII, 119) advised to stretch the placental portion of the cord (which is easily distinguished from the fœtal end by its elasticity and slighter tension) toward the placenta, so as to admit of being slipped back over both shoulders. In the case of a seven months' fœtus, whose funis was firmly coiled around the thigh (*Schmidt's Jahrbücher*, II, p. 132), Roos was compelled to cut the cord because it prevented the delivery of the fœtus, which presented in a breech-and-foot position. Should the cord be too tightly stretched in breech presentations, the placental end must be pulled so as to loosen it; but if this fails, nothing remains but to apply a *double ligature* and cut the cord; to be followed, of course, by immediate extraction. If the fœtus is astride of the cord, the placental end should be slowly drawn down and the loop be pushed over the posterior buttock or foot, because the cord is best protected against pressure on the posterior pelvic wall. If it be noticed during the extraction of the trunk—the head having been previously delivered—that the cord is very short and taut, the patient should be advised to flex the leg at the knees; then the child's trunk should be slightly lifted toward the abdomen of the mother for the purpose of preventing dragging on the cord and placenta; after that the child is to be placed transversely close to the external genitals and the cord tied as near the umbilicus as possible, and—as my father once was compelled to do—a second ligature applied in the vagina. But we must beware of pulling too hard upon the child, as this may cause hemorrhage (comp. *Lucina*, II, p. 63).

Appendix.—Spontaneous Amputation of the Fœtus, so called.

LITERATURE.

Martin: "Zur Selbtsamputation des Fötus." Hecker: *Monatsschrift*, III, 401. Hohl: "Lehrbuch," II, Aufl., p. 355. Owen: Obstetr. Trans., VIII, 4. Nebinger: Schröder's "Lehrb. f. Geburtsh.," p. 208. Hermann, G.: "Vier Missbildungen." In. Diss. München 1882. Bar, P.: *Annales de Gynécol.*, 1882, Jan.

A particular deformity, a mutilation of the child, which may be produced by the cord becoming coiled too tightly around it, but occurs very seldom, is the so-called spontaneous amputation of the fœtus, whose mode of origin requires a few words of explanation. Besides the furrows and marks of strangulation due to coiling of the cord which have been observed by de Laar, Sandifort, Meckel, Siebold, Montgomery and Nütten, complete atrophy of the peripheral portions of constricted extremities has been found. The limbs in question seemed, at the first glance, to be amputated, but a thorough examination proved them to be merely shrunken, shortened and atrophied. In some cases, however, these parts appeared to be really snared off; a case in point is that of Schwabe (*Siebold's Journal*, XVII, 218) in which the right foot of a three-months' fœtus had been nearly severed by a true knot of the umbilical cord. Ninon (*Dublin Journ.*, 1841, May) saw a fœtus around whose thigh, immediately above the knee-joint, the cord had formed a firm constriction which had cut through the soft parts to the bone. Hillairet (comp. Hohl: "Lehrbuch," p. 355) describes a case in which the neck of a three-months' fœtus was only 1 mm. thick at the point encircled. Morgagni reports a case of fracture of the left thigh due to strangulation by the cord. E. von Siebold, in his little book ("De circumvolutione funiculi umbilicalis," 1854), has given an illustration of a still-born child in which the cord had so firmly encircled several portions of the child's body that, after uncoiling them, deep impressions remained and the tibia appeared severed. Simpson observed a rudimentary miniature reproduction of the lost part of the stump of an amputation, in the form of nails and small processes extending from hypertrophic scars and fleshy connective tissue. Fingers and toes are most frequently thus deformed; next to this the thigh, forearm and upper arm (especially the left). P. Bar found true cicatricial tissue in a child born with congenital amputation; the skin in the constriction of the middle finger was atrophic, in a state of fibrous degeneration, and merging immediately into the fibrous elements of the periosteum; the latter was in a state of chronic inflammation; the parts situated peripherally from this furrow were in a state of elephantiasis in consequence of the prolonged disturbance of circulation. These facts leave little room for doubt as to the occurrence of atrophy and severance of the soft parts, and even of the bones, from unusually tight strangulation by the cord at an early period of the fœtal life; their origin during the life of the child can only be explained by the fact that small and thin parts of the fœtus are encircled by a portion of the cord which contains a taut, narrow and sharp filament capable of cutting in deeply. The compression, however, need not necessarily be so great as to materially occlude the vessels of the fœtus and cause its death. The coil does not yield, the parts of the fœtus are growing, and thus arise the deep constrictions. Fracture of the bones is sometimes followed by complete detachment of the limb; sometimes the severed limb is found in the fœtal sac, having remained there after the amputation (*E. Martin*). This mode of origin of so-called spontaneous amputation is, however, much rarer than that caused by amniotic bands, which have been discussed in detail with the anomalies of the fœtal membranes.

(6) Lesions of the Umbilical Cord Occurring During Labor.

LITERATURE.

Casper: "Qu. medicini," Bd. II, p. 874. Chiari, Braun, Späth: *Klinik*, pp. 75–80. Claudy: *Med. and Surg. Reporter*, Phila., 1885, LIII, 331. Coleman: *Lancet*, II, 14, Oct., 1864. Croom: Tr. Edinb. Obst. Society, 1881–82, VII, 27. Dupouy, Omer: "De la rupture complète du cordon ombilical pendant l'accouchement." Paris, 1885. Eustache: *J. d. sc. méd. de Lille*, 1887, IX, 73. Fruitnight: *Med. Rec.*, New York, 1887, XXXII, 623. Hugenberger: "Bericht," pp. 18 and 37. Meirieu (obscure case): *Froriep's Notizen*, VII, p. 80. Neville: *Med. Press and Circ.*, London, 1883, N. S., XXXV, 76. Talbert: In. Diss., *Mississippi Valley Med. Monthly*, Memphis, 1883, III, 6. Winckel: "Die Bedeutung präcipitirter Geburten für die Aetiologie des Kindbettfiebers," 1884. Winckel: "Klinische Beobachtungen zur Path. der Geburt," 1869, p. 330.

The injuries which the cord may suffer during labor are either complete rupture or merely lacerations; the latter may be associated with rents in the amnion or injury and rupture of isolated vessels, of one or both arteries, or of the vein. If the amnion be ruptured at the same time, the blood will escape freely from the genitals, but if it be uninjured, the blood will flow into the funis, and *hæmatoma funiculi umbilicalis* will ensue and may attain the size of a hen's egg, as I have seen in several cases of prolapsed cord. Such a tumor may rupture later during the delivery and discharge its contents. Pluskal described the rupture of a varix, the size of a hen's egg, of the umbilical cord; but as such enormously large varices are extremely rare, the tumor may have been a ruptured hæmatoma (*Oester. med. Wochenschrift*, 1843, No. 26).

The time of occurrence of the lesion may be in the first, second or third stage of labor; hence the prognosis for mother and child will differ accordingly. In the stage of dilatation the cord may be torn into or across if absolutely or relatively short, or if its insertion is velamentous. In turning the child during version, or by traction upon the fœtal parts around which the cord is coiled—as, for instance, in breech presentations—it may be injured even before the os uteri is completely dilated. Rupture of the cord frequently occurs in precipitate and street labors, in the last part of the second stage, or immediately after birth. In more than three-fourths of these cases the cord is ruptured in the fœtal third, within 15 cm. from the child; in 12 per cent. close to or within the umbilicus; still more rarely in the middle or the placental third of the cord. The rupture may also be associated with the formation of a hæmatoma on the placenta (*Winckel*, Case 37). In *the stage of expulsion*, lesions of the cord may be caused by instruments, such as the forceps, the crotchet, or even by the hand, if it is caught by the cord while searching for the feet, or in repositing the cord if inserted near the internal os and too much force is used. In the third stage the cord is frequently torn in the attempt to remove the placenta by traction before it is completely detached.

The *effects* of the lesions *upon the child* differ according to their extent, whether partial or total, and whether an artery or the umbilical vein has been ruptured. While the rupture of an artery is not always attended with danger, because it can easily retract, the rupture of the vein, if associated with laceration of the amnion, may be quickly fatal to the child by hemorrhage. If the amnion be intact, the hemorrhage may cease after the effusion of a certain quantity of blood into the funis; but the child will perish from compression unless speedily extracted. In such cases death will be due to suffocation and not to hemorrhage (comp. Case 11, *l. c.*, p. 48), or a combination of both. The danger of fatal hemorrhage owing to rupture of an umbilical artery will vary according to the location of the rupture. The danger is lessened if it is situated at some distance from the umbilicus. The position of the lesion varies according to its cause; for instance, in velamentous insertion it may be at or near the insertion of the cord; and near the middle if it be coiled around the child, when it will affect that part which is most tensely stretched over the nucha. In the case of Nägele ("Lehrbuch," p. 676, note 2) an artery had been opened and the vein nearly severed, five inches from the umbilicus; the child was strikingly pale. In precipitate labors the funis is sometimes torn off close to the umbilicus or even within the umbilical ring; thus a case is reported in Starke's *Archiv*, III, 3, 459, in which the cord had been torn off at a distance of one inch from the umbilicus in a precipitate labor. Collmann had a similar experience, and Casper reported two cases in which the funis had been torn off close to or within the umbilicus. I found the break once at 4 cm., another time at 1½ cm. from the umbilicus, and once quite close to it. Under such circumstances the hemorrhage may be fatal to the child.

The bad effects *upon the mother* have been considered in connection with short umbilical cord, so far as they result from traction on the placenta. They will be more serious for her than for the child if, in so-called precipitate labors, the cord is ruptured with a sudden jerk by the rapid expulsion of the fœtus. I have reported five similar cases. Prominent among the ill effects must be named very profuse hemorrhage in the third stage, tearing off of fragments of the placenta and membranes, and also diseases in the puerperium. Many experiments have established the fact that any cord will be ruptured by a weight of 2.5–11.5 kgm. In all my cases rupture occurred almost instantly with a weight of only 2.5–4 kgm.—that of the child—whenever the support was suddenly withdrawn from the weight fastened to the cord. Children, however, very rarely die of hemorrhage from the non-ligated severed cord. None of our children whose cord was ruptured by the fall perished, because help was near at hand when profuse hemorrhage occurred from the rupture at the umbilicus; while, as stated above, rupture of a vessel effected at the end of the first stage in cases of velamentous insertion is fatal to more than 75 per cent. of the children. Predisposition to rupture is caused by a thin, varicose, and much twisted condition of the cord (comp. *Späth*, p. 79).

The *diagnosis* of rupture of a velamentously inserted cord has been discussed above. Injury of the cord will be suspected whenever a quantity of blood escapes suddenly, the child's heart-beats become very frequent, then rapidly diminish, and in the absence of any other cause of the hemorrhage or the diminution of the fœtal pulse. The laceration of the cord is usually not discovered until after the head is born, as in one of my father's cases in which the child died of hemorrhage; or it may be first noticed during the extraction of the body. It may be suspected when—as in a case reported by Sclafer—the head at first does not yield to the forceps and then suddenly follows with a jerk, and is accompanied by a certain amount of blood.

Treatment.—In speaking of velamentous insertion, the fact that ruptures may sometimes be averted has been discussed. If the rupture be felt or seen, the child must be extracted as soon as possible and the bleeding cord compressed and tied. If the rupture be within the umbilical ring and the vessels are bleeding, they must be transfixed with a bent needle. If the vessels do not bleed, a compress of salicylated cotton may be applied and the umbilicus firmly bandaged. As a matter of course, during the treatment of the cord the general condition of the child must be taken into consideration. When the child was anæmic and did not respire vigorously, the old method was to defibrinate some of the maternal blood by beating it, and then to inject it into the umbilical vein. The more recent and better method is the injection of 250 gm. of a salt solution (0.6 per cent.) into the umbilical vein. This procedure has been successfully used in children who were quite anæmic. The danger to the mother should be borne in mind; all traction on the cord should be avoided; the fundus uteri should be caused to contract by friction; if hemorrhage persist, the placenta should be removed by expression and minutely examined with reference to its being complete. The contraction of the uterus must be watched for some time on account of its tendency to relax and to considerable after-hemorrhage.

(7) Parenchymatous Changes in the Cord.

LITERATURE.

Beale: *Schmidt's Jahrbücher*, Bd. 96, 56. Hyrtl: "Die Gefässe der menschl. Nachgeburt," 1870, pp. 120, 121. Klob: "Path. Anat. d. w. Sexualorg.," p. 566. Maier, Rud.: *Virchow's Archiv*, Bd. 45, 319; 324. Pluskal: *Oesterr. med. Wochenschr.*, 1843, Nr. 26. Scanzoni: "Prager Vierteljahrsschrift," 1849, Nr. 1. Winckel: "Klin. Beobachtungen," pp. 230, 231. Von Wittich: *Virchow's Archiv*, VII, 2; 328.

Disturbance of labor is not caused by anomalies in the nutrition of the cord; but they do exert an influence upon the child. The first of the anomalies to be mentioned is *phlebectasiæ, varices* of the umbilical vein (comp. *Hyrtl*, p. 119); they form, as a rule, on the convex sides of the spiral turns of the vessel and in such veins as describe larger convolutions around the arteries which run a straighter course. Hyrtl found isolated varices only at the placental end, one of them was as large as a walnut. He thinks, however, that the thickness and strength of the funis would not easily permit rupture of large varices. Marked convolutions and varicosities of the umbilical vein usually owe their origin to compression of that vessel, which leads to stasis with consequent dilatation, and if this continue for some length of time, to a more marked convolution of the placental extremity of the vessel. As a rule, only the portion of the cord near the placenta exhibits well-marked, close convolutions, while that nearer the child shows but few or none. When the tension has reached a certain degree it is equalized either by the passage of some of the liquid contents through the vascular wall—*serous transudation*, producing a kind of *œdema of the cord;* or red blood-corpuscles pass out along with the serum, *small extravasations of blood* being found *without rupture of the vessels (as I once demonstrated)*. Such hemorrhagic infiltrations will increase *pari passu* with the intensity of the circulatory disturbance. Hyrtl has described a very remarkable case of this kind. The umbilical vein showed on the trunk and its three primary branches an enlargement exceeding the size of a thumb, which extended to all the venous ramifications visible on the concave surface of the placenta, with a corresponding decrease in thickness. At the point of transition into the placenta the vein exhibited two *strictures* close together. Some branches of the vein again dilated at the placenta into sac-like pouches one inch in diameter. Strictures were found here and there between them which consisted of *newly formed connective tissue*, which followed the course of the veins in broad strips or bands, but did not affect the arteries. The formation of connective tissue was most tense and compact at the venous wall. Hyrtl considers this condition a consequence of periphlebitis placentaris, described by R. Maier. The processes are probably caused by the disturbances of nutrition usually consequent upon the diapedesis of white and red blood-corpuscles through the vascular wall. Scanzoni claims to have observed an instance of inflammation of the umbilical vein; in its interior loose and firmly adherent thrombi were found, and a thick, fibrino-purulent deposit extended from the placenta to the child's liver. Hyrtl emphasizes the fact that the fœtus connected with the placenta, described by him, was alive and well developed, because the changes had not extended as far as the villous ends of the umbilical vein. This is confirmed by a case observed by us (see Fig. 72). Hence, the very convolutions of the vein may counterbalance the abnormally strong pressure more or less and thus lessen the danger for the child. This will depend largely on the nature and intensity of the pressure: the more slowly and gradually it increases, the sooner compensation may be effected by the spontaneous coiling of the vein; the more rapidly it increases, the sooner will transudations, extravasations and rupture of the cord and hemorrhage into the placenta occur. Von Wittich has described a case of thrombosis of the umbilical vein which is worthy of mention. The gravida had had a fall four weeks before being delivered of a fully developed child. The walls of the umbilical vein were thickened, dirty yellow, opaque, and showed deposits at some points on the inner surface of yellowish, thickened strips which contained fat. Thrombi were also found firmly attached to the wall, and numerous fibrinous infarctions were present in the parenchyma of the placenta.

Klob says that Rokitansky found nutritive anomalies in the cord, in the shape of hyperplasia of the arterial coats (atheroma), thrombosis, obliteration of the vein and œdema of the cord. Beale states that he found *dropsy of the cord* only once in 1225 labors. These disturbances in the nutrition of the funis have not, as yet, received the attention they deserve, bearing as they do on the nutritive and developmental anomalies of the child and the placenta.

(8) New Growths of the Umbilical Cord.

Our knowledge of neoplastic formations of the cord is deficient. *Cysts* alone are mentioned; they are said by Scanzoni to range in size from that of peas to beans, and in rare cases to that of a hen's egg, and to occur only in dead fœtuses. In one of our cases (Jaffé) the cord, 2 cm. from its insertion, contained a cyst the size of a hazel-nut with yellowish contents. The cysts are said to be complete, that is, provided with walls and epithelium of the inner surface. O. Halen (Inaug. Dissert., Leipzig, 1864) found a cyst 4 cm. long and 3 cm. broad in the cord of a hydatiform mole, the embryo being 4 mm. long, and regarded it as a remnant of the *allantois*. The embryo had died owing to the formation of the mole, which he thinks could likewise have been the cause of the dilatation of the allantois and the dropsy of the amnion.

Hydatids of the cord are also mentioned by R. Froriep (*Klob*, p. 566). At the placental end of a thick, juicy umbilical cord we found many hydatids, and quite a group of them around the point of insertion; the placenta being likewise in a state of hydatiform degeneration. The fœtus was obtained from a 44-year-old Vpara, and had been long dead, labor ensuing in the 31st week. The *myxoma of the chorion*, in this case, had evidently extended to *Wharton's jelly in the umbilical cord.*

(9) Presentation and Prolapse of the Umbilical Cord.

LITERATURE.

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Definition.—By presentation of the cord we mean that condition in which it is found above the internal or external os, that is, still in the uterus; we call it *prolapsed*, when it has descended from the uterus into the vagina or beyond the vulva. Some term it presenting, so long as the membranes remain intact, and prolapsed, when it has passed through the opening in the membranes. The palpable portion of the cord must always be double, that is, form a loop, so long as it is not ruptured. Either a small loop or a larger coil or even the *entire cord* may be felt. The latter is the case, for instance, in breech positions and a low insertion of the cord, when the placenta has a low implantation and the umbilicus has entered the os uteri. In *incomplete prolapse*, so-called, *the descensus* funiculi, the cord is not to be felt in the os uteri, but a loop of it has descended so far as to lie close to the neck, the cheeks, or the head of the child, and passes through the parturient canal along with the child—a position liable to become as dangerous to the child as complete prolapse.

Historical Notes.—According to Kohlschütter, Jacob Primerose was the first (1655) who distinctly mentioned prolapsed cord. From the same authority we learn that the first two cases of this form of dystocia were described by C. Viardel (1673) and P. Portal (1683). Chr. V. Völdern observed a case in 1687; Amand, in 1714, reported 18 cases; Mauriceau (1771), 39; De la Motte (1791), 14.

Etiology.—An indispensable prerequisite to the occurrence of prolapse of the cord is that the internal os uteri, or the cervix, be not completely filled by the presenting part of the child. This condition is caused by very different circumstances. Wigand and G. A. Michaelis have correctly maintained that prolapse of the cord could not occur, when the lower segment of the uterus undergoes uniformly regular contraction, and that the continuous contraction of the lower uterine segment around the presenting part of the child was the most important obstacle to prolapse of the cord. If the wall of the lower uterine segment does not closely surround the child, it leaves room for other parts. This is the case whenever it is displaced, compressed, stretched or relaxed. Hence, the predisposition to prolapse of the cord is furnished by—

(a) An anomalous state of the maternal parts. They are: 1. *Pelvic anomalies.* A narrow pelvis is a very important predisposing cause, inasmuch as it impedes the proper engagement of the presenting part, permits it to deviate from the os uteri, and favors the occurrence of face, brow, and transverse presentations. In face presentations, 2.7 per cent. are complicated with prolapse of the cord. Among 55 cases of prolapse of the cord I have positively ascertained by actual measurement 22, or 40 per cent., of narrow pelves. Among 356 labors in contracted pelves I found prolapse of the cord 33 times, or nearly 10 per cent. Hirschfeld also found pelvic contraction to be the most frequent predisposing factor, the proportion being as high as 25 per cent. Hildebrandt states that the proportion of contracted pelves in prolapse of the cord amounted to nearly 33 per cent. Hecker, in his two essays (*Klinik*, I, 165 and II, 103), does not mention this predisposing factor among 50 cases, but this does not prove that it did not play an important part even in his cases. An *abnormally great inclination of the pelvis* has also been mentioned as a predisposing factor, but lacks proof.

2. *Faulty states of the uterus,* especially faulty shape, faulty position, and faulty contraction, favor prolapse of the funis. Mechanical obstacles to the descent of the presenting part may also be furnished by the presence of *tumors, myomas of the uterus,* which, even if located in the upper part, exert a decided influence upon the attitude and presentation of the fœtus and therefore upon the prolapse of the cord. Süsserot found 10 cases (or 6.8 per cent.) of prolapse of the cord among 147 cases of labor complicated by uterine myomata; this is three or four times as often as usual. *Faulty position* of the *uterus,* especially pendulous abdomen, predisposes to prolapse of the cord, inasmuch as it often impedes the prompt and regular engagement of the presenting part and causes its abnormal mobility in the latter part of pregnancy. If Hirschfeld found this anomaly only twice in 59 cases, we

are justified in assuming that it has not received sufficient attention in most of those cases. Prolapse of the cord appears to occur more frequently in German than in English clinics; perhaps because cases of pelvic contraction are more frequent in the former than the latter. J. Simpson thought this greater frequency in Germany was to be ascribed to our custom of confining our patients in the dorsal position with raised shoulders, but in this he is undoubtedly mistaken. *Prolapse of the cord occurs more frequently in pluriparæ than in primiparæ.*

Hohl	found it in	14 Ip.	and	81 mp.
Hugenberger	" "	10 "	"	57 "
Hecker	" "	8 "	"	42 "
Elsässer	" "	9 "	"	32 "
The Author	" "	18 "	"	35 "

That is, there were only 59 primiparæ among 306 parturient women with prolapse of the cord. As these labors, with few exceptions, were observed in lying-in hospitals, and as in these the proportion of Ip. to mp. is about 1 : 1½, it follows that multiparæ present that anomaly about three and one-half times as often as primiparæ.

3. It needs no further proof that a predisposition to the anomaly in question may be caused by *tumors of other soft parts*, especially of the ovary, in so far as they bear upon the size of the pelvic cavity, and upon the form, position and contraction of the uterus, and also upon the attitude, position and presentation of the child. Not less important are: *(b) The predisposing factors* emanating from the fœtus and its appendages, viz.:

b.

4. *The sex.* Hecker found a remarkably large number of boys and, in head presentations, a marked predominance of the second position.

5. Faulty engagement and presentation of the fœtus. We have already mentioned *face presentations*, but *footling* and *tranverse* presentations are especially predisposing. There were found in prolapse of the cord by—

Amand	in 18 cases,	12 head pres.,	4 breech pres.,	2 transverse,	— face pres.
Mauriceau	" 39 "	23 "	5 "	9 "	— "
de la Motte	" 14 "	10 "	— "	1 "	1 "
Hugenberger	" 68 "	26 "	27 "	14 "	1 "
Hecker	" 40 "	23 "	17 "	6 "	— "
Hirschfeld	" 51 "	34 "	9 "	8 "	— "
Winckel	" 55 "	36 "	10 "	8 "	1 "
	285	164 = 56.9%	72 = 25.2%	50 = 17.5%	3 = 1

Massmann estimated the frequency of the prolapse as follows:—

In head presentations,	0.67	or 1 : 150.
" breech "	4.70	" 1 : 21.
" transverse "	8.5%	" 1 : 12;

that is, breech presentations are complicated with prolapse of the cord about 9–10 times, and transverse positions about 20–25 times as often as head presentations. The proportion of their occurrence in general is about = 1.5 : 15; in other words, one prolapse occurs to every five cases of transverse, and one to every 11–14 of breech presentation, while, as will be shown later on, one prolapse occurs to every 150 labors. The reasons why transverse presentations predispose so largely to prolapse of the funis are: 1the close proximity of the cord to the os uteri, 2the shortening of the long axis of the uterus; 3imperfect adaptation of the wall of the uterus to the lower parts, and the premature, rapid and complete escape of the waters.

6. *Twin pregnancy is another predisposing factor.* Hildebrandt found four cases of twins among 109 cases, which is twice the usual frequency.

7. *Faulty shape and development of the child,* also entanglement of the cords of twin fœtuses have been previously considered among the predisposing causes; but they are very rare.

8. *Faulty attitude of the fœtus* has been claimed as a predisposing factor, especially by Hohl and Scanzoni. Hecker denies it. To me it seems highly probable that the faulty attitude of the fœtus is usually the result of the same predisposing and exciting causes as the prolapse of the cord. But it is certainly true that the cord is kept back by the normal attitude, especially that of the arms, and that it finds more room and less obstacles when the arm has slipped down; hence, there will certainly be numerous cases in which small parts prolapse and, when this condition has continued for some time, descent of the cord ensues. The connection of the two anomalies may not, however, be demonstrable in every case, especially if both are found to coexist. Hugenberger found 14 instances of faulty attitude of the fœtus in 68 cases of prolapse of the cord.

Abnormal size of the child has an effect similar to that of a contracted pelvic strait.

9. Predisposing factors on the part of the cord are: (*a*) *excessive length.* Hecker estimated 71 cm. as the average length for head positions associated with prolapsus of the funis; 69 cm. as the general average of 124 cases. Of 26 cases, accurately measured, I found the average length to be 66 cm. the shortest being 48 and the longest 118 cm. The average would, therefore, exceed the common mean by 12–16 cm. This abnormal length is sometimes connected with a very abundant development of the jelly, rendering the cord *uncommonly heavy.* On the other hand, there is quite a number of cases in which the cord may be short, even very short, and yet prolapse; for instance, in pelvic and transverse presentations also in, (*β*) *abnormal insertion* of the cord, especially in marginal insertion near the lower edge of the placenta, and in velamentous insertion near the os uteri. Hugenberger has established the fact that *marginal insertion is found three times as often in cases of prolapse of the cord as central insertion;* the proportion in

other cases being 1 marginal : 1.5 central. (γ) A certain predisposition may be due, paradoxical though it may sound, to coiling of the cord. While it is true that this coiling may generally be regarded as an obstacle to prolapse, yet, if the cord be long and the head slip to the side where the face is, the cord at the nucha, being in the lower uterine segment, may loosen and—there being room in the os uteri—may glide over the occiput; this could hardly have occurred during this change of the child's position but for the coiling of the cord. This mode of origin is rare, but we are compelled to assume it in those cases in which the cord extends from one side of the pelvis to the other transversely above the head, so that a simultaneous descent of both ends of the cord must be presupposed. Hildebrandt found this predisposing factor 12 times in 109 cases.

10. *On the part of the placenta,* its low attachment and partial situation over the os is an important predisposing factor, because the presenting part does not so completely enter the lower uterine segment, and is very liable to push down the cord mechanically if it be inserted near the break in the membranes. Placenta prævia occurred three times in my first 55 cases, while otherwise it is of much rarer occurrence (1 : 1500). Hildebrandt observed a low implantation of the placenta nine times in 109 cases of prolapsus of the funis, and among 62 cases of placenta prævia in my own practice, prolapse of the cord was met with four times.

11. An excess of liquor amnii, *hydramnios,* may, as before mentioned, predispose to prolapse of the cord (in 14.3 per cent. of the cases, according to Hugenberger) by rounding off the flattened ovoid shape of the uterus and rendering the child abnormally movable.

II The *exciting causes* which produce the prolapse, in the presence of the conditions mentioned and one or more of the predisposing factors, are abnormal movements of the mother or the child. Active and violent movements of the parturient, such as driving over rough roads or running at a rapid pace, will impart motion to the uterus and shift the contents of the liquor amnii; the cord will gradually work down as far as the os uteri, because its specific gravity is greater than that of liquor amnii. Uncommonly extensive movements of the child, such as a rapid change of attitude or position, will also give rise to prolapse, because the cord is necessarily moved, shifted and often freed from entanglements and therefore lengthened. It may also be pushed down by the descending parts of the child as the lower uterine segment becomes empty. Thus a procidentia arises within the membranes when the placenta has a low implantation and the cord a velamentous or marginal insertion. A similar effect is produced by an unfavorable escape of the liquor amnii, that is, when it occurs very suddenly or at a time when the cervix happens to be free, as when the parturient is straining very hard or is in an unfavorable position, such as standing or sitting, in which the quantity escaping exceeds by far that which is lost in the recumbent position, beside passing in a shorter time. The cord is thus swept down when the membranes rupture. We must also mention the pains as an active factor, especially if they force down parts of the child against the cord. In analyzing a number of cases of prolapsus of the cord, it will be easy to prove that it was not a single predisposing factor alone, but that, as a rule, several of them have coöperated, and this, too, in the most varied combinations.

In a case observed by me, the principal cause was found to be antero-posterior contraction of the pelvis, the conjugata measuring about 9 cm. The other predisposing factors were: an abnormally long (70 cm.), heavy and thick cord, having a low insertion (only about 12 cm. from the os uteri), and a very large, vigorous child, weighing 3750 gm. The prolapse was caused by the sudden escape of the liquor amnii while the gravida was standing in the kitchen, thus being in an unfavorable position, and besides she had to walk a considerable distance to the institution. It should be added that the transverse position of the cord in front of the head led us to assume the fact that it had been coiled around the neck as a probable predisposing factor.

As this example sufficiently proves, the predisposing factors present are by no means always very pronounced, that is to say, the pelvis much contracted, the insertion purely marginal or velamentous, the cord of excessive length, the child very large, or the position markedly faulty; it is rather the concurrence of numerous factors that determines the faulty presentation. This complexity of combinations—heretofore dwelt upon by Michaelis and Hildebrandt—will, therefore, partly account for the great difference in its frequency in obstetrical clinics (see below). An interesting fact, moreover, which, I think, was pointed out by Hugenberger only, is that prolapse of the cord also occurs habitually. Hugenberger met with it in one parturient four times in sucession with head presentation, and, another time, twice in the same patient, with transverse presentations, without any contraction of the pelvis. The question as to the *seat of the prolapse* is also to be considered in connection with the etiology. As far as I am aware, Elsässer is the only author who has paid any attention to this question. He found the cord presenting or prolapsed 13 times in front, 5 times at the right side and posteriorly, 13 times at the left and posteriorly, 4 times undefined, that is, transverse across the head. The cord generally descends on the right or left side along the promontory, rarely on the lateral wall of the pelvis, and still more rarely in the middle of the anterior wall of the pelvis. The *frequency* of prolapse of the cord in different clinics is very variable; thus it was found by:—

Boivin	once among	521	births.	
Collins	"	245	"	= (401 : 98,512).
Churchill (Dublin) .	"	164	"	= (304 : 50,061).
Hildebrandt . . .	"	149	"	= (301 : 45,040).
Hugenberger . . .	"	120	"	= (68 : 8,210).
Winckel	"	107	"	= (92 : 9,843).
Hecker	"	88	"	= (40 : 3.519).
Abegg	"	85	"	= (72 : 6,167).
Credé	"	63	"	= (23 : 1,217).

We thus see that the smaller the number of cases observed the greater i the frequency.

Its occurrence is of course much rarer in private practice. It is difficult t obtain reliable figures, because (as I have shown in other places: "Bericht und Studien," III, 405) very frequently the midwife is not present when i occurs, and they omit it in their reports, from fear of being punished for no summoning a physician. For instance, in the district of Laupheim (comp Hagen: Inaug. Dissert., Munich, 1884, p. 21) it occurred in 1882 onl twice in 1229 labors—a close approximation to the figures given by Boivin According to the midwives' books, in the Principality of Lippe it occurred from 1880–83, only 27 times in 12,254 labors—that is, 1 : 457 cases (Theopold: *Deutsche med. Wochenschr.*, 1885, XI, 83–85).

Diagnosis.—When a loop of the funis has slipped down and is found to present in the os uteri alongside of the presenting part, a thorough examination with the finger will readily discover it; a cord the thickness of a finger, and somewhat twisted, is felt, and it pulsates more or less vigorously when the child is living. It may be displaced, hooked upon the finger, and its course followed up into the uterus along the presenting part. In one case, during an auscultation at the beginning of an examination, the marked retardation of the child's heart-sounds led me to suspect pressure upon the cord and to diagnosticate its prolapse, which was immediately verified. If the cord is not low enough to be grasped, or if it is pulseless, it is sometimes difficult to recognize it. Those cases in which descensus or incomplete prolapse of the cord exists, admit of merely a probable diagnosis: the recognition of intra-uterine pressure on the cord leads us to suspect that such a displacement exists, although it cannot be proved. It may be ascertained, by means of auscultation, that a previously well-located cord has slipped down again and that a new prolapse is threatening, whenever, after replacement, the cardiac sounds increase again in frequency and strength, and then, after some time, an umbilical souffle or murmur, which existed previous to the reposition, is heard again. I called attention to this in my "Klin. Beob.," p. 237. In many cases where the cord has descended low into the vagina, or even beyond the vulva, so that it may be seen, we can obtain a direct view of the changes the organ suffers during compression.

The diagnosis of the presentation of the cord is somewhat more difficult, because it is more movable in the liquor amnii, its pulsations are not always so distinctly recognized on account of the membranes, and it cannot be as easily grasped and palpated as when the membranes are ruptured. An abnormal quantity of jelly may also be present, especially near the margin of the placenta between the membranes, and be mistaken for the cord, and a pulsating artery of the cervical lips for the pulse of the cord. Auscultation will best guard us against this error. The cardiac sounds of the child must be synchronous with that pulsation; if they are more frequent, the cord cannot be the cause of it. I have sometimes found that the detection of the pulsations was difficult for students; but the recognition is easy when the loop is slightly stretched by hooking the finger over it or by compressing it gently against the presenting part, the os uteri, or the pelvic bones.

Symptoms.—The symptoms caused by prolapse of the umbilical cord are recognized partly by the prolapsed loop, partly by auscultation of the abdomen of the parturient. The changes in the accessible part of the cord pertain to its volume, convolutions, and pulsations. Whenever the loop is pressed upon at any point its volume increases and it becomes perceptibly thicker toward the placenta. This increase is caused not only by the convolutions becoming denser and more numerous, but also, undoubtedly, by a transudation into its tissue; the *cord becomes œdematous* and sometimes interspersed—as stated above—with small extravasations of blood. As all the parts within the uterus are exposed to a higher pressure during the pains than those outside of it, the afflux of blood into a loop lying in the vagina must be increased and the efflux diminished during these contractions, unless the cord is directly compressed against some other part. The above-described change, the swelling of the prolapsed cord, must, therefore, be effected by the pains alone. *Hence, every pain when the cord is prolapsed, whether in head, breech or transverse presentations, is accompanied by a certain amount of danger.* The pulsations diminish considerably in frequency at the same time, so that in five seconds they sink from 13 to 12, 11, 10–4. This marked fall is caused by the pressure on the cord which greatly impedes the emptying of the uterine arteries and hence perceptibly increases the obstacle to be overcome by the heart, while at the same time it retards the afflux of blood to the heart through the umbilical vein and retards its filling. When the pressure relaxes and a pause in the pains ensues, the cord becomes smaller, the convolutions are less prominent, the pulsations rise slowly at first, then suddenly, and often attain a much greater frequency than before, especially if the previous diminution in the fœtal heart sounds was very marked. We thus counted in one of our cases a frequency of only 48 pulsations during the pain, but of 156 in the pause, that is, more than three times as rapid.

Changes of location in the cord may sometimes be ascertained; as a rule, they are caused by the displacement of the presenting parts, so that it is pushed farther down or more to the side. In rare cases the presenting cord may again become inaccessible and, as it were, "draw itself back." Hildebrandt thought that this fact, which is frequently observed, could only be explained by assuming that the lower portion of the uterus, in moulding itself to the higher parts of the head, gently crowded the smooth cord up over the latter. I am, however, of the opinion that the cord becomes inaccessible either because the descending fœtal part, without displacing it, descends so far that we can no longer reach the loop which has remained in its former position, perhaps because the length of the cord does not permit any further descent; or else because it is drawn back, *i. e.*, higher up, owing to the child's active movements which increase the distance between the umbilical region and the os uteri. Or it may be that a partial coil of the cord may become complete by a change of position of the child, for instance, from the first to the second vertex, and that the descended portion of the cord is utilized in the formation of the loop. I have also succeeded, by placing the woman on the side opposite to the prolapse—for instance, on the left side when the prolapse was on the right side—in causing the withdrawal of the cord from the pelvic inlet.

The *prolapsed cord very rarely becomes an obstacle to delivery;* in fact, it does so only in case it is stretched so tightly over the presenting fœtal part that it actually prevents its descent. Trefurt, having once tried in vain to reposit the cord, which was stretched across the head, divided it and quickly extracted the child with the forceps; of course, it was dead. In the case of a first breech position in which the cord was stretched between the child's buttocks and its pulsations had already fallen to 60, I pushed the cord over the posterior foot and extracted a living, though not fully developed girl. If in such cases the cord be very tense, severe hemorrhage would surely follow, owing to detachment of the placenta. When the pressure reaches a certain degree, the umbilical cord becomes pulseless, and may remain so for some time without causing the child's death. Thus, Kisker found a pulseless cord in a case of lateral position complicated with prolapse of the funis and contracted pelvis; he applied the forceps and extracted an asphyxiated child, which was soon revived. Elsässer states that absence of pulsation in the cord is a sign of death only when it continues for some time and is accompanied by other signs equally indicative of the child's death. Tellegen asserts that if the prolapsed cord be tied, and thus complete pressure be brought to bear upon the three vessels, the children could still be born alive, even if the version was not completed until after 12–26 minutes. I have observed a case in which the pulseless cord was reposited behind the head and, a few hours later, a living boy was born spontaneously. Massmann remarks that successful results have followed the reposition of the pulseless cord. Charpentier obtained a living child by version and extraction ten minutes after the pulsations of the cord had ceased to be felt. On the other hand, there are cases in which the child died very quickly though the pressure was of but short duration. Elsässer pointed this out, and a few such cases have come under my own observation.

We shall be able to ascertain by auscultation the frequency and force of the child's cardiac sounds, the existence of an umbilical murmur, and any abnormal character and frequency of the child's movements. If the pulsations of the cord have become feeble or have ceased altogether, it will be of paramount importance to ascertain whether the heart sounds can still be heard, for in that event operative aid will be indicated and should be resorted to as soon as possible. Any umbilical murmur points to the presence of pressure. As to the child's movements, it should be noted that the more frequent and forcible they are, the more probable becomes the diagnosis of incipient pressure. They finally cease after very violent and tumultuous movements. A certain duration and intensity of pressure render the child's death inevitable. Death is generally caused by suffocation or by suffocation and apoplexy combined, according as the circulation was interrupted quickly or suddenly at a time when the heart still possesses its full energy. In such cases we find at the autopsy ecchymoses or even effusions into the epicardium and upon the pulmonary artery; extensive ecchymoses in one or both lungs; they may be scattered or aggregated, punctiform or of considerable size; they are also present in the thymus and thyroid glands. The liver, spleen, kidneys, trachea, and cerebral meninges are unusually hyperæmic, the brain is œdematous and sometimes extravasations of blood are found between the dura mater and the cranium. In addition, a turbid, grayish-white or more greenish fluid may be pressed from the cut surface of the lungs and may also be seen with the naked eye in the trachea—a proof of the premature attempt at respiration. In other cases the ecchymoses are few—some in the lungs, a few upon the large vessels, none in the heart, and yet meconium is found in the bronchi. The main cause of these differences lies in the heart, as I have shown elsewhere by two cases. The greater the heart's power of overcoming the obstacles present, the quicker will capillary effusions of blood take place and the more extensive they will be. The more gradually the compression increases, and the more the strength of the heart is paralyzed by a resistance which increases for some time, the less will be the ecchymoses, not only in the heart, but also in the lungs and other organs. In order to correctly determine the cause of death in children by pressure on the cord, we must in every case thoroughly examine the condition of the heart and its vessels, and we shall often discover why numerous ecchymoses and apoplexies exist in one case, while they are almost or entirely absent in another case. The death of the child has also been attributed to coagulation of the blood in the cord, owing to its prolapse beyond the external genitals (see *Tellegen, Groningen*). But this view has been sufficiently refuted by Kohlschütter and needs no further comment. The cord becomes cold and limp only when its pulsations have ceased, and this is the case when the child has been dead some time or suffered prolonged, great pressure.

In conclusion, a peculiar variety of prolapse may be mentioned which was described by Duclos (*Toulouse S. J.*, 62, 199). It happened in a primipara 24 years old, in whom a loop of the cord, 22 cm. in length, together with the left hand, had *prolapsed from the anus* through a transverse laceration (6–8 cm. long) of the posterior vaginal wall. Von Štroynowski, in

1886, observed a similar case, in which he subsequently discovered a recto-vaginal fistula.

Prognosis.—The danger to the *child* from presentation, prolapse, and incomplete descensus of the cord will be manifest from the following statistics. Engelmann found that, of 365 cases of prolapse of the cord, 171 children (or 47.7 per cent.) were saved, and therefore 52.3 per cent. succumbed; 71 per cent. being saved in footling presentation, 70 per cent. in breech, and only 36.7 per cent. in vertex presentations. Of 225 more recent cases, however, one-half were saved (*Hildebrandt*). Massmann found the rate of mortality to be only 45 per cent. Of 53 of my earlier cases, 23 = 43.5 per cent. children died. Some of these, however, should be deducted, as they might, in all probability, have been saved if proper assistance had been promptly at hand; so that we might assume about 40 per cent. as the actual rate of mortality, which nearly agrees with Hecker's figures, 37.6 per cent. (*Klinik*, II, 187; 194 cases). The time when the prolapse occurs, the position of the child, the time of rupture of the membranes, the place where the cord has slipped down, the length of the loop, the degree of pelvic contraction, etc., will, of course, affect the prognosis. I have often observed that the presenting cord may be dangerously compressed even before the membranes rupture. As a rule, the best results must be attributed to reposition, which procedure is gaining ground more and more. Michaelis was one of the first authors to emphasize the excellent results of reposition of the cord, as compared with other methods of procedure. Mauriceau and Peu, it is true, had recommended reposition, and Deventer had advised it when the membranes were still intact, but they did not appreciate its value in comparison with other procedures in use. Michaelis stated (*N. Z.*, III, 1), in his first essay, that while it was true that at Würzburg, Marburg, Dresden and Kiel, 30 out of 41 children in cases of prolapse of the funis were stillborn, and only 11 saved, yet it was equally true that by reposition he had saved 9 out of 11 children; and in his second communication (*N. Z.*, IV, 2) he remarked that of 17 children 14, or 82 per cent., had been saved. According to Wegscheider, 62 per cent. of the children were saved by reposition. I have employed reposition with success 10 times in 13 cases, and all the children were thus saved. To some extent, however, the prognosis with reference to the child depends largely on the presentation. It is decidedly most favorable in vertex presentations; for, according to Massmann, there were born:

Of	310	children in	vertex presentation,	176 living,	134 dead.
"	60	" "	breech "	34 "	26 "
"	43	" "	transverse "	17 "	26 "

These figures agree well with Hecker's and the author's experience, and prove that, in prolapse of the cord, the prognosis is most unfavorable when the presentation is transverse. With regard to the operative procedures called for, Massmann found that there were born, after reposition, 71–72 per cent. living, 28–29 per cent. dead; in transverse presentations with version and extraction, 49 per cent. of the children living 51 per cent. dead; in natural breech presentations, 50 per cent. of the children living, 50 per cent. dead; after extraction, 58 per cent. living, 42 per cent. dead; in natural vertex presentations, 34 per cent. living, 66 per cent. dead; after the application of forceps, 61 per cent. living, 39 per cent. dead; and after version, 46 per cent. living and 54 per cent. dead. Therefore, when the delivery was left to nature, more children died in vertex than in breech presentation, obviously because there is more space in the small pelvis in the latter cases and the presenting part is not as unyielding and hard as the head. The prognosis also depends on the predisposing factors and the complications. It has been stated above that the cord, if inserted very low, is compressed much more easily and sooner than when the insertion is higher, and that reposition often fails in the former condition. We have also stated that the child is in great danger when the insertion is velamentous. Prolapse of the funis is likewise unfavorable when placenta prævia coexists, the majority of such cases terminating fatally to the child. As a rule, the prognosis is better the later during delivery the prolapse occurs and the further the labor has advanced, since any operation required may then be performed more quickly, with greater safety, and without any material impediments. The danger begins not merely with the pressure on the cord, but it exists, as we have proved heretofore, with every pain, as soon as the loop has slipped into the vagina. A very brief but powerful pressure often suffices to kill the child; this pressure is liable to occur at any moment, and we must regard it as imminent even if the cord occupies a position in the os uteri and the small pelvis where it does not appear probable. It may, however, be compressed even if higher in the uterus. Therefore, whenever the cord presents, we should not delay until it is compressed, but await the moment when we can perform the operation which best protects both mother and child; under certain circumstances, immediate reposition or artificial termination of the labor. The danger to the child has not been entirely averted even after reposition, because certain accidents may have supervened—for instance, premature respiration—which greatly jeopardize if they do not preclude its subsequent extra-uterine existence. The cord may also slip down again after a short time and be compressed anew. Changes may have taken place in the cord, such as rupture in the vein, which render its reposition completely futile. Hence we must not rest content with a successful reposition, but determine the true prognosis for the child by the quality of the fœtal pulse after reposition. As to the *mother*, the prognosis does not depend directly upon the prolapse of the cord, but rather upon its causes and the operations which are rendered necessary by it. Reposition of the cord is a procedure of but slight or no danger to the parturient if carried out carefully; but if the hand be hastily, clumsily, and forcibly introduced, lesions of the genitals, especially deep lacerations of the cervix, anomalous pains, detachment of the placenta, etc., may ensue. None of the patients in whom I employed reposition fell seriously ill; most of them remained well in the puerperium, and none died. According to Hohl, among 95 of these patients, only two died, one of apoplexy and the other of putrescentia uteri; hence, only one of a direct consequence of labor. We may assure a pluripara with wide genitals that the procedure is not very painful and is generally quickly performed.

Treatment.—In many cases the patient may be guarded against prolapse of the cord by causing her to lie down in bed as soon as the pains commence, and warning her not to walk about. This applies especially to those cases in which the presenting part has not descended very far or where the os uteri is not completely filled. The patient's position should be nearly horizontal; she should be cautioned against bearing down too early, so as to prevent the precipitate rupture of the membranes. The application of a moderately distended Barnes' dilator has also been recommended for this purpose. Under some circumstances, for instance, when the head presents and the os uteri is moderately dilated, the liquor amnii should be allowed to escape slowly in order to prevent a sudden rush of the waters, and to secure a uniform pressure of the cervix upon the presenting fœtal part. A certain position of the patient is, in some cases, of paramount importance; for instance, when the head is displaced laterally, she should rest on the side toward which the head has slipped; it will then resume its position above the pelvic inlet, while the umbilicus and the cord, owing to the gravitation of the child's breech toward that side of the patient, will be farther removed from the os uteri. Deventer advised, in cases where the cord prolapses in front of the sacrum and the vertebræ, to place the patient, provided she be not too weak, on her knees and elbows, while the midwife with one hand pushes back the child's head and frees the loop (Deventer: Bruier d'Ablaincourt, "Observations importantes," Paris, 1739, p. 221). An attempt at reposition in the knee-elbow position might be made in some cases. A slow downward pressure of the child's head from without over the pelvic inlet deserves attention as a prophylactic measure against descensus of the cord.

If, however, the cord has descended so far as to be felt in the os uteri and is still pulsating, we must assist the child as soon as it can be done without injury to the mother. If the labor has advanced far enough to enable us to terminate it rapidly, we should proceed to operative interference and apply the forceps, provided the head is in a proper position and the cervix almost or quite fully dilated. In applying the blade of the forceps which comes nearest the cord, we must see that it is not included in its grasp. Under some circumstances, therefore, we shall have to apply the right blade before the left, and then cross the handles. If the presentation is a breech or footling, extraction of the presenting part should be performed as soon as the cervix has become wide enough to present no material obstacle to the passage of the head. When the cervix is not sufficiently dilated and the pulsations are still normal in rate and strength, we must wait and attempt nothing more than to push the projecting loop to a part of the cervix where it will not be directly touched by the descending fœtal parts. Should the fœtus be astride of the cord, its placental end should be carefully drawn upon and the loop loosened far enough to allow it to be slipped over the posterior buttock. But if the cervix is almost or quite fully dilated, the head still high up, and the pelvis not greatly narrowed, while the lessened pulsations of the cord indicate danger to the child, direct internal version with subsequent extraction of the child is indicated. If the cervix admits one or two fingers, the child being still movable, its head high up and the pelvis but little if at all contracted, combined version according to Braxton Hicks should be performed. If the compression of the cord has lasted only a very short time, its manual reposition followed by drawing down of the child's head is to be preferred. If a transverse position of the child is complicated with prolapse of the cord, version should be followed by immediate extraction, the former being hardly feasible without considerable pressure on the cord. Unfortunately, the results of these operations are very unfavorable for the children, as already stated; hence Michaelis' method is advisable. He reposited the cord first, even in transverse positions, although it was to be expected *à priori* that it would easily and soon prolapse again. In a case of transverse position, Dr. Wm. Harris, of Philadelphia, pushed the prolapsed cord over a knee and thereby saved the child (*Parvin*). A successful reposition of the cord will be of particular importance for the child before the cervix is sufficiently dilated for performing version. The operative termination of the labor—by forceps, extraction by the breech, or version and extraction, as the circumstances may require—is also indicated when reposition of the cord fails on account of continual recurrence. Only in rare cases of prolapse of the cord can the expulsion of the child be safely left to nature. I met with but a single instance in my first 55 cases, and Spiegelberg has observed five similar ones. The conditions which indicate that the case be left to nature are: if the presenting part of the child has already descended very far, if the genitals are roomy, if the parturient is a pluripara, if the pulsations of the cord are undiminished and vigorous, the pains strong and frequent. Under these conditions a speedy termination of the labor may be expected; but even in such cases the parturient must not be left out of sight for a moment, and we must ascertain the child's condition at frequent intervals by palpation and auscultation.

If, however, the os is still narrow and the membranes are unbroken, a different mode of procedure is indicated. The object then is to place the cord in such a position as to guard it against injurious pressure. Sometimes, as in transverse and breech presentations, it needs only to be pushed somewhat higher up and toward the posterior pelvic wall, and the actual reposition may be postponed until the os uteri has become wider. But in all cases in which the pulsations of the cord commence to diminish, omphalotaxis, the reposition of the prolapsed funis, is the only procedure indicated. According to Michaelis, this reposition is done by pushing the cord above the segment of the uterus which is contracted around the presenting head or breech. Hence, according to the same authority, the cord can only be reposited when the head is still in the uterus. I should add that in this way it is at the same time dislodged above the small pelvis.

If reposition has succeeded, but the fœtal heart sounds do not soon recover their strength and frequency, and continue to be faint and retarded although the prolapse has not recurred, but one remedy is left to us—the speedy extraction of the child. But we must beware of resorting to version or the forceps in the case of an asphyxiated or dying child before the os uteri is sufficiently dilated; for the result would be extremely doubtful as regards the child, and the mother would be exposed to great danger without any compensatory advantage. The case reported by me in the *Berliner klin. Wochenschrift*, 1884, No. 9, is a sufficient illustration of the correctness of this view.

CHAPTER III.

Disturbances of Labor due to a Faulty State of the Child.

I. Faulty Attitude of the Fœtus.

LITERATURE.

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The attitude of the fœtus is faulty, if its head or its extremities are not in the customary relation to its body; if, that is, they do not rest against the anterior surface of the trunk, but have slipped or been pushed away from it. The fault may be present in one of the parts named or in several. When the brow and face enter the pelvic inlet, it is usually called a faulty presentation; the term indicating that the child is in a passive state, nevertheless they belong to the faulty postures just as much as prolapse of the extremities does.

We shall first discuss the faulty posture of the child's extremities as disturbing causes of labor. The extremities of the child may have descended alongside of the head or of the breech. Mauriceau reports a case of labor in which the head, arm and foot of a living and fully developed child presented together. De la Motte found all four extremities presenting alongside of the head. Those attitudes of the child are also faulty in which an arm of the fœtus in transverse positions has slid down into the vagina; but this occurrence has no more significance for transverse positions and the process of parturition, than where one or both arms have descended alongside of a breech presentation. We will therefore discuss only those faulty postures of the child in which one or more extremities have descended with the occiput, vertex or face.

The slightest degree of this displacement, and undoubtedly the one most frequently met with, is that in which one or both hands lie alongside of the head of the child, but so that the fingers cannot be felt deeper in the pelvis than the vertex; the depth of the arm in the pelvis is somewhat greater when the elbow lies close to the head, because in this case the forearm usually lies deeper and, therefore, below the head. This presentation becomes a prolapse whenever the presenting fœtal part has advanced down into the vagina, usually at the moment when the membranes rupture. As a rule, the extremity descends on the side corresponding to its insertion into the trunk. It is an extremely rare occurrence for an extremity to be forced down farther than the neck, on the opposite side; for instance, the left arm over the right temple. The arm seldom lies transversely to the head; and it is a still rarer occurrence for an attitude to be found in which the hand lies at the occiput, and the forearm at the side of the head corresponding to its shoulder (Pernice's case, l. c., p. 13). The rarest of all attitudes is that which was first described by Simpson, and afterward was observed by P. Dubois and Playfair, in which one arm passed behind over the nape of the neck.

The statements of authors differ greatly as to the frequency of the presentation of the extremities. It certainly is true that the proximity of an extremity near a presenting part is more frequent than is usually stated by most authors. As the occurrence is liable to be overlooked and as the extremity is often pushed back during labor, the prolapse rarely interferes with delivery. The frequent notice of the condition in the reports of obstetric institutions merely proves that assistance has been expected on its account, but it does not establish its frequency during labor. This may be said, for instance, of the Berlin Clinic and Policlinic (*N. Z.*, v, 88, and *N. Z.*, XXVIII, 67), where among 4124 births, 91 = 2.2 per cent. anomalies of this kind occurred under Busch's service. Baudelocque found, among 17,499 births [illegible] 2400 ; Chiari, 13 : 9639 = 1 : 741 ; Bland, 8 : 1897 = 1 : 237 ; Merriman, [illegible] 2047 = 1 : 223 ; Depaul, 163 : 16,613 = 1 : 102, etc.

Hugenberger found, among 8210 children in St. Petersburg :—

In	133 cases,	1 hand alongside of the head.
"	4 "	both hands alongside of the head.
"	3 "	1 hand and 1 foot alongside of the head.
"	1 case,	1 foot alone, alongside of the head.
"	1 "	both feet alongside of the head.
"	1 "	both feet and both hands alongside of the head.
"	4 cases,	1 hand alongside of the breech.
"	3 "	2 hands alongside of the breech.
"	1 case,	1 hand alongside of the face.
"	1 "	both hands alongside of the face.

[illegible] noted, among 2801 labors in the clinic at Halle :—

[illegible] hand alongside of the head	26 times	= 1 : 111
[illegible] alongside of the head.	8 "	= 1 : 361
[illegible] and foot alongside of the head, ...	5 "	= 1 : 578
Both hands alongside of the head.	4 "	= 1 : 722
[illegible] and hand alongside of the head, ...	2 "	= 1 : 4445
Both [illegible] and 1 hand alongside of the head, . . .	1 time.	
Both hands, [illegible] and cord alongside of the head, .	1 "	
[illegible] hand and cord together alongside of the head,	1 "	
	48	= 1 : 60

[illegible] is of the opinion that the displacements near the face seemed to [illegible], since no statement concerning it was found in any of the tables, [illegible] as far as he knew, but one accurate observation was on record, [illegible] was by Hecker (see also Hugenberger above). On the con[illegible] found among 400 face presentations 20 cases (5 per cent.) of pro[illegible] or both hands, and, in addition, four cases of one foot, and [illegible] both feet alongside the face, which gives us 25 cases (or 6.2 per [illegible] faulty attitude with face presentations.

[illegible] of these reported cases are Hecker, Hoffmann, Credé, Du-[illegible] Hugenberger, Michaelis and others.

Among [illegible] labors I found :—

One hand at the neck, ...	26 times.
" " " " head, ...	19 "
" " beside the cheek, ...	4 "
" " " " face, ...	1 time.
Both hands beside the head, ...	3 times.
One foot " " "	3 "
Both feet and 1 hand, ...	1 time.
Total,	31 = 2.4 per cent.

Compare Figs. 11, 12, 27.

At Dresden I found 199 cases of faulty attitude in 6385 births = to 3.1 per cent. We thus see, that of the different forms of abnormal posture, that of prolapse of a hand alongside the head occurs most frequently; next comes an arm; then both hands; next one hand and one foot; very rarely both hands and one foot; and rarest of all, all the four extremities. The prolapse usually occurs in the posterior half of the pelvis, more rarely in the anterior, there being, probably, more space behind. The simultaneous prolapse of the cord in one-seventh of these cases is explained by the fact that both anomalies presuppose the same conditions, are affected by the same predisposing factors, and owe their origin to the same causes.

Etiology.—Both mother and child supply the predisposing causes. On the part of the mother these are: a faulty, that is, a globular shape of the uterus (hydramnios, twins); faulty position of the uterus, especially occurring with a pendulous abdomen, because this condition is apt to prevent the proper entrance of the child's head into the cervix. Faulty contractions of the uterus have likewise been assigned as a cause; they may indeed be able to force down one or more extremities alongside of the presenting part, inasmuch as they are capable of effecting a displacement of the latter. A narrowing of the pelvic inlet also predisposes to prolapse of an extremity because it may readily impede the descent of the head into the small pelvis and favor its displacement toward one side. On the part of the child we may mention an unusual size of the head (acting similarly to pelvic contraction), also extraordinary smallness and pliability of the latter, besides death and maceration of the fœtus, as causes of prolapse of an extremity.

Exciting causes are sudden escape of the liquor amnii; faulty position of the parturient, whereby the head is removed from the pelvic inlet; sudden shocks, as a fall, or particular kinds of occupation, for instance, manual work in the field; unsuccessful attempts by a midwife or physician to produce a normal longitudinal position by means of external or internal manipulations; sudden discharge of the liquor amnii, together with a rapid delivery at a time when the child is in a transitory position from a breech to a head presentation; for instance, the breech having been forced to one side, one foot still remains above the cervix, and the head is forced down near the foot by vigorous and rapidly recurring contractions of the uterus. If one hand is near the head and the former is grasped by the uterus, it can easily be pushed downward, since the uterine contractions always act on the elbow and force it lower. If there is a foot near the head, the strong tension of the vertebral column will, in many cases, draw even the head more to one side, so that it remains comparatively high up, while the foot advances during the pains. Pernice says that prolapse of the lower extremities chiefly arises when these are not flexed at the knees, the thighs, indeed, being drawn toward the abdomen, but the legs hanging down extended along the body of the fœtus.

Symptoms.—The influence of the prolapse of one or more extremities upon the process of parturition is exerted both upon the entrance of the head into the pelvic inlet, and on the mechanism of its passage through the pelvis. The conjugate diameter is perceptibly shortened and the entrance of the occiput impeded by the projecting arm, especially when it is prolapsed anteriorly. The occiput is pushed to one side and impelled against the ilium, and then vigorous contractions fix the small bi-temporal diameter above the conjugate; thus by the prolapse of an arm, a face presentation may arise from a vertex position. Thus the faulty posture of one extremity has caused a faulty position of the head. That this obstruction does actually cause the face position is proven by those cases in which a deep impression is made on the fœtal skull by the arm (compare my "Klin. Beobacht.," p. 83, Bang's case), and also by those instances in which the arm is so firmly wedged in, that it cannot be reposited, for instance, in Hohl's case (*Monatsschrift*, XVII, 135). The obstruction will, naturally, become still greater and the deviation of the head take place sooner if, in addition to the hand, a foot or both feet have become prolapsed. If the uterus at the beginning of labor is not strongly contracted, if the pains succeed each other but slowly, and if the child is still movable, the head may deviate still more to one side, and a vertex position may gradually be converted into a transverse one. This process has been accurately observed by Michaelis ("Das enge Becken," etc., p. 184), and may occur oftener than might be supposed from the very small number of cases reported. If the pains fix the head above the pelvic inlet, the prolapsed extremity may cause the head to turn around its sagittal diameter and thus force the posterior parietal bone to descend lower; the sagittal suture then lying closely behind the symphysis pubis. This occurs especially with prolapse of an extremity along the anterior pelvic wall. The reverse—an unusually deep incarceration of the head with the anterior parietal bone lowest and the prolapsed extremity lying behind the head—appears to occur much more rarely.

The prolapse of an extremity anteriorly may cause the head to engage and be delivered with the occiput turned backward, that is, in an occipito-posterior position.

In some cases when both arms have descended no disturbance may be caused, the fœtus, in such cases, being usually small, and one arm compensating, as it were, for any disturbances produced by the other. As a rule, if one prolapsed extremity projects lower than the other, any deviation from the normal mechanism will be caused by the one which lies deepest. In some cases, however, the arm lying posteriorly and higher up may likewise furnish the chief obstruction. If one or both feet have become prolapsed, the head, owing to the consequent greater flexion of the neck upon the body, remains high in the pelvis, as a rule, and it is liable at the same time to deviate laterally. The most accurate statements concerning the effect of faulty attitude of the child upon the mechanism of labor have been supplied by Birnbaum. The compression of the uterine wall leads to abnormally painful and yet inefficient, and also to spasmodic contractions, which are fraught with danger for both mother and child.

If the arm has descended in front of a sacro-iliac synchondrosis, it may sometimes remain there without materially disturbing the mechanism of labor.

It is evident that perineal lacerations may arise much more readily, owing to the circumference of the head being increased by the arm descending and passing out with it.

It may be of interest to state, that among 118,202 confinements, in 1878, in private houses in Saxony, a hand or arm had to be reposited in but eight cases, and the cord likewise in eight cases, which proves how very often midwives overlook such complications of labor.

Of these eight cases the most interesting (No. 1205) was one in which the physician discovered a rent in the recto-vaginal septum of a parturient, and also that the arm, prolapsed in front of the head, had passed through the fissure and out through the anus. He reposited the hand through the anus and the fistula, drew forth the head in the second vertex position, united the fistula with catgut, and the patient did well.

In Starke's *Archiv* (Bd. VI, p. 625), a delivery is described in which head, knee, one arm and the cord presented, and a vesico-vaginal fistula was the result of these anomalies.

An abnormal rotation of the head may take place after its delivery, for instance, in a first vertex position, toward the left thigh of the mother. It is caused by the engagement of the shoulder which, in its turn, is influenced by the prolapsed arm. If in a first vertex position the right arm has prolapsed in front and to the right side, and the head has passed in the antero-posterior diameter, the shoulders cannot engage in the left oblique diameter because its anterior end is occupied by the arm; they will first turn into the transverse diameter and subsequently into the right oblique, and finally from this into the antero-posterior. This process occasionally takes place in the small pelvis, the arm near the symphysis being pushed aside—since it impedes the rotation of the shoulder forward—and the other shoulder moving beneath the symphysis.

It is a remarkable fact that the arm near the head sometimes recedes sub partu and ceases to be an obstacle. This is generally caused by its displacement, resulting from its meeting some point of resistance on the uterine wall or on the small pelvis; it certainly is but rarely caused by the active or reflex motions of the child, the occurrence of which would more likely have had such an effect before the rupture of the membranes. It has been supposed by Arneth that a special contraction of the uterine fibres surrounding the extremities of the child may cause the latter to be withdrawn; but this would be difficult to prove. I once observed the recession of the arm at the commencement of labor, in a face presentation ("Berichte," Bd. I, p. 68).

The *diagnosis* of faulty posture of the extremities near the head is easy in cases in which they have descended pretty low alongside of it; but more difficult, though not impossible, if situated higher up. We need not explain how the hand is distinguished from the foot. The particular extremity—whether right or left—and the manner of prolapse must be accurately ascertained, as the prognosis and treatment are in part dependent on these. Cases like those mentioned above and described by Simpson, Dubois and Playfair, in which the arm was thrown across the neck may, at best, be only diagnosticated by the introduction of the half or whole of the hand. Since there is little occasion for this in head positions, except in cases of hydrocephalus, this anomaly of attitude is generally only perceived after the delivery of the head. Any existing complications, such as a contracted pelvis, prolapse of cord, etc., must also be sought for.

The *prognosis* depends on the roominess of the pelvis, the size and position of the head, the position of the arm, the strength of the child, the nature of the pains, the duration of the labor, and the character of artificial aid called for. The largest statistics in regard to the last point have been furnished by von Franqué.

Among 247,570 births occurring in Nassau from 1843–59, operative procedures were required in 86 cases of prolapse of the extremities alongside the head. In 53 of these 86 cases forceps were applied, the result being 17 children born alive and 36 (!) stillborn; version was performed 17 times—4 children living, 13 dead. Reposition was performed 16 times, the results being 10 alive, 6 stillborn. The mortality of 64 per cent. of the children indicates the great danger of this complication, 67 per cent. of them alone having succumbed in applying the forceps.

I wish to point out the important bearing on the child's life of coiling of the cord combined with a prolapse of the child's extremities. It can easily be seen that if but one hand lies near the head and the funis is twisted around the child, that hand may exercise a pernicious pressure upon the cord.

I have observed several interesting cases of this kind. In one the left hand lay alongside of the neck in a second vertex position with a loosely coiled umbilical cord; the boy perished, in spite of the somewhat rapid delivery, from pressure on the cord sub partu. Face, breast and arms exhibited a large number of ecchymoses scarcely as large as a pin-head; the child was suffocated, the pressure evidently being so fatal because the left arm, which was anterior, had prolapsed. Another case, reported by Martin (*Monatsschrift*, XX, 11, 204), and observed by me, concerned a IIpara of 21 years, with a first vertex position. Both feet had prolapsed; the cord was twisted around the neck; the right hand was alongside of the neck; the child was stillborn in spite of a speedy termination of the labor, though the feet had only to be pushed back, and the child was living after the head had passed through the vulva.

If the arm is deeply prolapsed, it may be kept away from the neck by the curvature of the head and constitute, as it were, a protection for the cord without pressing upon it. But even in the absence of any coiling of the cord, the child is sometimes born asphyxiated in consequence of the deep position of the extremity. This is partly owing to the prolonged and severe pressure exercised by the uterus upon the child's body and the placenta until the former succeeds in overcoming the obstacle; and partly to the greater compression of the child's skull, especially at its base. Œdema of the scrotum and escape of meconium frequently occurs in the first case. Thus at Dresden a female child, recently dead and fully developed, was born of a 22-year old primipara after the usual term of labor, in the first vertex position with the right arm prolapsed. The post-mortem examination showed very extensive hyperæmia of the brain, free effusion of blood on the convexity and base, œdema around the intra-abdominal part of the umbilical vein and of the retro-peritoneal connective tissue. The mother had a left-sided ovarian tumor the size of an apple.

Marked impressions are sometimes found on the child's skull. Hecker witnessed a labor in which an impression on the forehead was caused by the prolapse of a foot, the back of which fitted this impression. In Bang's case, mentioned above, an impression was found at the root of the nose and in the temporal region. In the Berlin Policlinic there was a IIpara with a flat, rachitic pelvis, in whom a first vertex position was observed together with prolapse of the right arm, the right parietal bone being considerably depressed by the arm, and the skin above it was torn to a certain extent and the right arm also exhibited signs of compression. The child—a well-developed girl—was dead, and showed fissures on the parietal bone, ecchymoses on the cranial bones, slight hemorrhages into the pia mater and a reddish serum in both ventricles; there was no apoplexy in the cerebral substance. Schmidt (Scanzoni's "Beiträge," III, 218) found a faulty attitude five times among 889 births in the Würzburg Clinic, three children dying or being stillborn. In my observations on 57 children with faulty attitude, 6, or nearly 11 per cent., succumbed, which is nearly four times as many as when there is no such complication. In six cases of faulty attitude, my father succeeded in extracting only three alive with the forceps.

The child being small, the position of the extremities favorable and the pelvis wide, many deliveries occur with prolapse of extremities—in some cases several of them—in which the labor proceeds as quickly, smoothly and successfully as when no such complications are present. Arneth, for instance, observed a spontaneous termination of labor of a fully-developed child, who was delivered alive, in which arm, foot and cord were prolapsed.

Treatment.—When one or both arms or one or both feet are prolapsed, and the pelvis is roomy, we may wait as long as the extremity constitutes no impediment to the position of the head and does not prevent its rotation and advance.

In order to prevent the arm from descending lower and to assist its withdrawal from the pelvis, we should place the parturient on the side toward which the head has deviated, or tends to deviate.

If this does not succeed, it has been advised to push the extremity, if in front, toward the sacro-iliac synchondrosis with one or two fingers, to a place where there is more room and where it does not so readily impede the process of delivery.

Siebold recommended, in case of the prolapse of both arms, to place them both posteriorly, but I agree with Pernice's view that this shifting of the arms is not to be approved, as it is not without danger, and is often unnecessary even if easily accomplished, and at any rate not as good as the reposition of the arm.

Deventer, Mme. Siegemundin, Merckel and v. Haselberg recommend trying to induce the child to withdraw the hand by pinching it and thus producing pain; others have laid little pieces of ice in the hand of the fœtus. Both methods are generally unsuccessful, but they cause no injury and may, therefore, be tried.

Some authors, as Peu, Froriep, Busch and Gardien, have endeavored to remove the obstacle to the head by holding back the extremity during the pains; this is a dangerous procedure. Wigand recommended as a means of effecting the reposition of the arm, pushing the head forward from the side opposite to the prolapse by means of external manipulations.

The safest and best method, without doubt, is the reposition of the prolapsed extremity. It has been undertaken by Rueff, Peu, Mme. Siegemundin and Deventer. Other authors, however, such as de la Motte, Levret, Ritgen and Arneth have expressed themselves quite decidedly against it. Levret, the oldest of them, feared that the vagina might be lacerated, while Ritgen, the most recent, was afraid that the head might be brought into a faulty position and, therefore, complicate delivery.

The object of the operation is the removal of an obstacle to the engagement and advance of the head. It is therefore indicated as soon as we have ascertained that such an obstacle is actually caused by the extremity. We recognize this contingency partly by the relation of the head to the pelvis and its movements during the pains, partly by the swelling and incarceration of the arm and of the soft parts of the mother. We must not, however, always wait until the impediment becomes quite evident, but operate even before it does so, in some cases. This should be done where the pelvis is somewhat contracted, the child large, or the extremity prolapses at the anterior pelvic wall, where we can pretty definitely anticipate the occurrence of delay and the injurious consequences of the incarceration of the arm. But as the reposition of prolapsed parts is merely preparatory to the delivery without accelerating it, it is superfluous or at least not indicated in all cases in which, owing to some danger to mother or child, a speedy delivery is advisable; for instance, when the child's heart sounds have become very weak, or when severe hemorrhage from the genitals appears or a serious swelling of the soft parts is present. It is more dangerous with a firm than with a movable head, but it can no longer be performed when the head is so low down that the introduction of the hand is very difficult or causes serious danger to the parturient. The existence of a stricture or a tetanic state of the uterus, will, for the same reason necessarily contra-indicate it. I cannot, however, admit that the prolapse of a loop of the cord alongside of the extremity alone furnishes a contra-indication against reposition of the latter. If no other complication exists, if the loop still pulsates vigorously and if the pelvis is not narrowed, I should prefer to reposit first the cord and afterward the hand, because the extraction by forceps when the head is high, and version when the cord is prolapsed are more dangerous to the child; while reposition of the cord is comparatively easy and generally successful. Version must be performed if reposition does not succeed, if several extremities have prolapsed, or if the head will not descend, or whenever a speedy termination of the labor is indicated, or if the pelvis has become so narrowed that the engagement of the head can no longer be hoped for. In such cases we must pass a string around the prolapsed extremity before looking for the feet, in order to facilitate its subsequent extraction.

While reposition is employed, especially in maternities, where the existing anomaly is ascertained early, often even before the rupture of the membranes, the practitioner is often compelled to apply the forceps on account of the delayed rotation and advancement of the head caused by the prolapsed extremity, because he is usually called in only after an incarceration of the head and the extremity has occurred, and when reposition is at least serious and generally more dangerous than the use of the forceps. The method of performing the operation in such cases will be described farther on.

In those rare instances of incarceration of the head by a hand or foot, where extraction cannot be effected by the forceps and for the same reason version of the child cannot be thought of, there remains only the reduction of the size of the child's head, which, when the fœtus is dead, must be quickly done in order to save the parturient.

If one foot of the child can be felt alongside of the head, or if both have descended, they should be reposited as an arm would be, provided that the pelvis is roomy, the position of the head normal, and there is no indication for hastening delivery. Even if the head has deviated and all the conditions for a regular delivery in the first vertex position are present, it is advisable to reposit the foot and to push the head downward. If, on the other hand, the necessity of speedily terminating the labor exists, owing to impending dangers for mother or child, or, if the extremities have descended very low alongside of the head, which does not descend in spite of vigorous pains, we should endeavor to draw down the breech with the foot, by seizing it with two or three fingers and drawing it toward the opposite side. Monroe thus succeeded with a IIIpara—in whom a leg, both arms and the cord had prolapsed alongside of the vertex, and the delivery had not advanced for thirty-six hours—in bringing down the breech with the leg and extracting a living child. If a great obstacle opposes the engagement of the breech, we should first pass a sling around the foot, then look for the other one and draw down the breech by traction on both at the same time; if we do not succeed, the head should be pushed away from the pelvic entrance with one hand, while the other pulls on the slings attached to the feet. If one or both feet are firmly wedged in alongside of the head, and its normal rotation or advance is decidedly impeded, we should resort to the forceps as soon as a further delay in labor would become dangerous to mother or child. It is evident that, if the application of forceps is not successful and the woman's life is imperilled, only perforation and extraction with the cranioclast remains. Those who desire to learn how difficult these cases may be, should read the report of my case ("Berichte und Studien," pp. 140–143) of a first vertex position with a prolapse of the right hand, the right foot and the cord.

II. Faulty Position of the Fœtus. Faulty Mechanism of Labor in Vertex and Face Presentations. Imcomplete Flexion of Head. Brow Positions. Face Positions, with the Chin turned backward.

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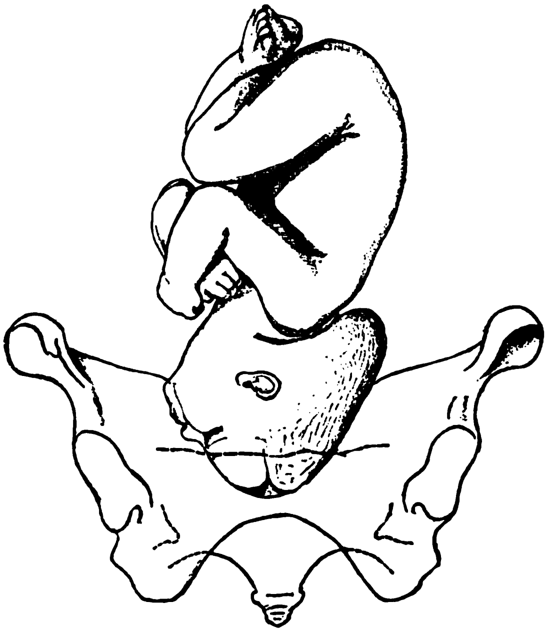
The above-named faulty positions of the child are sometimes met with at the commencement of labor, but generally develop during its course and to a certain degree are merely deviations from the ordinary mechanism of delivery. The slightest degree of deviation is the one in which the anterior portion of the fœtal skull has descended deeper, and thus the fronto-occipital circumference is engaged in the pelvic inlet. If the abnormal rotation of the child's head around its transverse diameter is increased, a brow presentation results. By this means the one or the other tuber frontale is brought toward the front and is lowest, and the mento-occipital circumference into the superior strait. If this rotation of the head continues, the occiput moves higher up, the chin descends lower down, and a face presentation occurs, which, if the chin turns to the side and front of the pelvis, may be terminated by natural means; if, on the other hand, the face together with the chin are deflected to the posterior part of the pelvis, an obstruction results, in which the chin with the upper part of the thorax are wedged in the pelvic inlet.

The *causes* of these anomalies are of a very definite character. The number and intensity of the predisposing causes are the greater the further this abnormal rotation has advanced. For the production of this condition the following factors act in unison: a large child with a hard skull; a narrow pelvis; sometimes a wide pelvis with a low transverse position of the head on the pelvic floor; an extreme degree of the condition of pendulous abdomen; a small amount of liquor amnii and slight mobility of the child. The following may also be direct causes of these faulty and very serious positions of the child, viz.: The continuous placing of the patient in an unfavorable position during labor; unskilful use of the forceps, especially when, in extracting, faulty traction is associated with very vigorous, rapidly recurring pains. On the whole, however, we must presuppose serious obstructions in the soft parts and bony canal of the mother, and also in the child. See Grenser's case: face presentation, chin behind and to the right; the child weighed 4400 gm. They may be present with a small child (as, for instance, in Smyth's case), with the prolapse of both hands and feet alongside the head.

The *symptoms* of these anomalies correspond to their causes. With increased obstruction the stage of dilatation progresses slowly and is retarded. The contractions become very painful and the woman early makes efforts at bearing down. The portion of the cervix and soft parts—the vagina and even the vulva—corresponding to the situation of the occiput, begin to swell; the membranes generally rupture prematurely; the rotation of the forehead toward the front is delayed or completely retarded; and a very large tumor is gradually developed on the front of the skull and the forehead. (Fig. 80.) The child's heart sounds become considerably retarded during the pains and rise unusually high during the intervals; meconium begins to be discharged. The physician finds himself compelled to resort to operative termination of labor, as the cardiac sounds of the child steadily diminish, which may be caused by lesions of the cranial vault and by effusion of blood into the cranial cavity (Solowiew's case), or as the maternal soft parts swell, or as the parturient becomes feverish. If medical assistance cannot be promptly obtained in brow and face positions with the chin turned backward, a rapidly increasing incarceration of the child's body into the lower uterine segment will end in contusion and laceration of the uterine wall, and in the latter case the child may enter the abdominal cavity through the rent. If the soft parts are yielding and not too rigid, in exceptional cases it may occur—after the death of the child and an extreme displacement of the cranial bones, the occipital and frontal bones sliding under the parietal bones—that the long oblique diameter becomes considerably shortened and the forehead escapes through the middle of the vulva, while the greatly flattened occiput passes out either behind the symphysis or over the perineum.

FIG. 80.

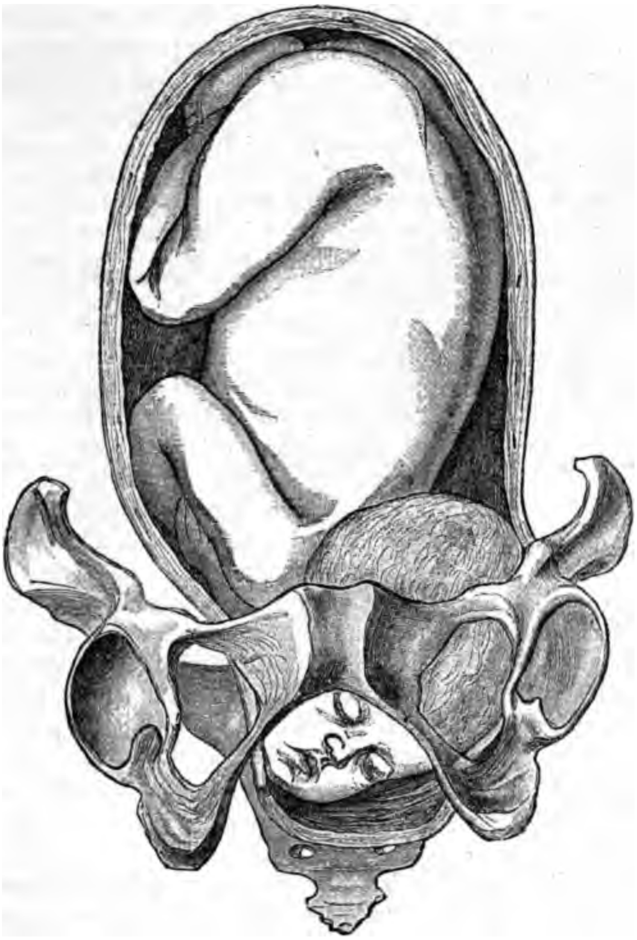


First Brow Presentation.

The delivery of a child in brow presentation, in which the face and chin first passed over the perineum, and then the occiput but poorly developed passed out under the symphysis, was observed by Leopold and Rasch in a living child 43 cm. long and weighing 2257 gm. The child's nose was flattened and displaced to the left; on its head was found a visible furrow behind the large fontanelle, at a point where the skull had been pressed under the symphysis. The fact that in brow presentations very large children may be saved was proved by a case of Bode's, in which the boy measured 53.5 cm. and weighed 3870 gm.

When in a face presentatiòn with the chin turned backward, the vault of the skull has become flattened by the pelvic wall (Fig. 81), and when the child has died and become pliable, the head becomes pressed into the trunk —as in partus conduplicato corpore—and may pass through the small pelvis with the trunk, while the chin, being the lowest part, appears first over the posterior commissure. The injuries sustained by the maternal soft parts—by

FIG. 81.



First Face Presentation, the chin backward and toward the right.

the uterus as well as vagina—are always very great. There have been cases reported, however, in which living children were born, finally, by the above mode of expulsion; nevertheless, we must not place any reliance upon such assistance from nature. Besides the above-described manner of delivery of the head in a brow presentation, the delivery of the head may, according to Helly, occur in a transverse diameter of the pelvis, in such a manner that the chin escapes on the side of the vulva and the ear anteriorly under the symphysis. Milne Murray has, with Simpson's axis-traction forceps, extracted a ten-and-a-half-pound child, who was asphyxiated and could not be resuscitated. At the commencement of labor the chin was directed downward and the face in the transverse diameter of the pelvic inlet. This child's arms are said to have been lying on its back in an almost parallel direction (?). There are also cases in which, when the pains are very strong, a change from brow to face, or even vertex presentation, takes place within the pelvis, or where the chin is even rotated toward the front. Hecker and Spiegelberg's statements, on the basis of 36 cases, that the second brow position (21) was more frequent than the first (15), are doubtful, on account of the small number of children. The same may be said of their statement that the children with brow presentations are, on the average, small (Bode's case, 3800 gm.; Grenser's case, 4260 gm. and 38 cm. for circumference of the head). Since only such children have evidently been counted in who were delivered with the brow presenting, and as with larger children the delivery does not occur in that way, on account of the necessary diminution of the size of the head and the extraction of the child, all these cases are dubious. It is, *a priori*, more probable that the heads of small children may more easily remain with the brow presenting during the course of the labor without being converted into a face presentation. The brow is not converted into a face presentation by a rotation of the head around the longitudinal axis of the child's body (Zweifel), but merely by a rotation around the transverse axis of the child's head. The rotation generally takes place in the transverse diameter of the pelvis, as that is the most spacious. The fixing of the transverse diameter of the fœtal skull in the conjugate of the pelvis renders a change from face to brow and again to vertex presentation possible.

Diagnosis.—Whenever the large fontanelle during labor descends lower than the small one, the advance of its anterior acute angle is recognized, and the development of the caput succedaneum around the large fontanelle is discovered. The shape of the head after this variety of delivery has already been described. Fig. 30 represents the skull of a small child born with a brow presentation. The right or left tuber frontale is lowest in a brow presentation; the supra-orbital ridge may be reached on one side, and the posterior end of the large fontanelle on the other; the caput forms on the forehead in the region of the tuber frontale. The child's cardiac sounds are heard near the median line, according as the back of the fœtus is turned toward the left or the right side. In a faulty face position the occiput is found more toward the front in the anterior and lower part of the uterus, palpable and visible from the outside; if examined internally, the vaginal vault appears flat, the chin stands high and is difficult to reach posteriorly. The cardiac sounds are heard with difficulty with the occiput turned toward the left and the chin situated behind and to the right.

Prognosis.—In order to afford more accurate information concerning the birth of large children who present in occipito-posterior positions, I will mention the 31 cases observed by me within the last ten years; 22 of them occurred with large children; 9 (40 per cent.) had to be extracted by forceps; two were stillborn, one died of convulsions on the first day after delivery; 13.6 per cent. of all succumbed. One of the mothers suffered a central rupture, another a perineal laceration of the second degree; several had small lacerations. In 9 cases the children were very large—on an average 3750 gm.—6 boys and 3 girls. Of these 9 deliveries 4 (44 per cent.) had to be terminated by the use of forceps; one mother was attacked with eclampsia and died from nephritis and peritonitis; the rest recovered; two of the children, one with the eclamptic mother and one with prolapse of the cord, were stillborn = 22.2 per cent.

Of all the 31 cases, 13 = 42 per cent. had to be terminated artificially; 5 children = 16 per cent. succumbed; 1 mother = 3.2 per cent. died. This suffices to show how serious the prognosis is with large children in occipito-posterior positions.

The prognosis for brow presentations is much more unfavorable. Long ascertained, in the cases collected by him, that 10 per cent. of all cases were fatal to the mother. His results as regards the children were as follows:—

Of 30	deliveries	spontaneously terminated,	7 died	= 23.3 per cent.
" 16	"	by a change of presentation,	1 "	= 6.6 "
" 11	"	" extraction with the forceps,	2 "	= 18.1 "
" 3	"	" version and extraction,	2 "	= 66.6 "
" 8	"	" craniotomy,	8 "	= 100 "
68		Total,	20 died	= 29.4 per cent.

With an unusual mechanism in face presentation with the chin over the perineum—cases reported by Flügel, Braxton Hicks, C. Braun, Köhler, Jacobs and Smellie—a living child weighing 3 kgm. was born in C. Braun's second case; in Köhler's case a fully developed and deeply asphyxiated child was born, which was resuscitated. In a case reported by Jacobs the still-born child weighed 4 kgm., and, although all attempts at rotation with the forceps had proved futile, the pains first forced the face together with the chin over the perineum, and the occiput followed afterward under the symphysis.

Treatment.—In occipito-posterior presentations with large children we should attempt to effect a rotation of the occiput forward by a proper position of the patient, either on the side toward which the child's occiput is directed, or by the knee-elbow position. If we are not successful, we should assist the movement of the sinciput downward and forward by placing the parturient on the side toward which the brow of the child is turned. When the child is in great danger, the forceps must be applied and the child extracted. The method of performing this operation will be discussed later. If the child is dead, we should perforate the large head and extract it by the cranioclast.

In brow presentations, where the head is still movable, and the pelvis is not too narrow, we should use pressure upon the occiput above the inlet of the pelvis, and thus endeavor to press the head into it. If not successful, if the liquor amnii has already escaped and the child is not particularly movable, the occiput may be forced down by the introduction of the whole hand into the uterus and seizing the occiput with the fingers (Smith's case). If, however, the pelvis is considerably contracted, version with subsequent extraction is to be preferred as soon as the cervix is nearly or completely dilated, provided that the child is not too firmly grasped by the uterus. If all of these attempts fail and the child is dead, or if the mother is in danger, we should perform perforation through the large fontanelle and extraction with the cranioclast or Mesnard's cranial forceps.

In face positions with the chin posterior and the head still high up and movable, in the absence of any indication for hastening delivery, and with only a moderately contracted pelvis, we should bring the occiput down by external or by combined internal and external manipulations—to be described later—and then leave the delivery to nature. If this procedure does not prove successful, if the face is still high up and the child not yet too tightly grasped by the uterus, version and extraction of the child should be undertaken as soon as the dilatation of the cervix will permit. If the child still lives and the incarceration of the face in that unfavorable position in the small pelvis does not admit of the treatment mentioned before, we should try to obtain the natural mechanism of labor by repeatedly applying the forceps and turning the chin forward. This procedure sometimes succeeds (*Grenser*, [illegible]). A more detailed description of this operation will be given later. If even this attempt proves unsuccessful and the mother is exposed to danger by the contusion of the soft parts, perforation through the frontal suture and extraction by the cranioclast are indispensable.

III. Faulty Presentation of the Fœtus.

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A presentation of the fœtus is faulty whenever its longitudinal axis does not coincide with that of the uterus. The fœtus in this case usually lies obliquely; much more rarely it is in an exactly transverse direction, so that the designation oblique presentation is more suitable than that of transverse presentation. There must, indeed, in the transition from a breech into a cephalic presentation—or vice versa—come a moment when the head and breech will be at a level on both sides of the uterus, while the fœtal part corresponding to the cervix has not yet descended. This moment, however, is of very short duration, and the head soon slides down, so that it takes a position on the ilium, while the opposite end of the body lies nearer to the fundus of the uterus. If P. Budin found the vertebra of the lower child, in a twin birth, extending from one linea innominata to the other, the upper child presenting by its head, and thus situated vertically to the lower transverse one, we must naturally assume that the upper child impeded the advance of the lower.

Weber and Späth termed the condition primary oblique presentation when it occurred before the rupture of the membranes, and secondary after their rupture; but for clinical purposes this is less significant than another classification, which designates as primary oblique presentations those that existed at the commencement of labor, and secondary those that occurred only sub partu from head presentations; as, for instance, in a prolapse of extremities, in head presentation with narrow pelvis, etc. The most frequent position of a child in an oblique presentation is that in which one of its sides is directed downward above the cervix, and in which, therefore, the shoulder (Fig. 82), an elbow or hand only can be felt above it. The thorax or a hip are very rarely found at the cervix. The attitude of the child is but little changed at the commencement of labor so long as it is still alive; in other words, the head is—as in the vertex presentation—somewhat nearer to the upper shoulder, the chin close to the thorax; the arms lie on the chest and the hands in front of it. The attitude is, however, usually changed after the rupture of the membranes and with the engagement of the shoulder, so that the lower arm very often sinks down into the os uteri and passes into the vagina; in rarer cases even the upper arm descends into the vagina. This occurred in the Rostock Clinic once in 18 cases. Hohl describes two cases of this kind (*Mtschr.*, III, 300 and 302). My grandfather observed 3 cases in 35. With stronger pains the head is more firmly pressed upon the upper shoulders, so that the longitudinal axis of the child's body is greatly curved, and forms an almost acute angle at the neck or at some part of the trunk.

The division of the oblique presentations varies greatly with different authors. Baudelocque's very complicated division has fallen into disuse. He assumed (1) that the head and body may lie corresponding to the antero-posterior diameter of the pelvis, the former toward the front or the back; (2) that the head and body may lie parallel to the transverse diameter, the former to the left or the right, and that in each of these positions the right or left shoulder may present. Mme. Lachapelle distinguished two presentations, viz.:—

I. Right side presenting, ...	*a.* Head to the left.
	b. " " right.
II. Left side presenting, ...	*a.* " " left.
	b. " " right.

Busch claims that there are four oblique presentations, each with two subdivisions, in which the child's head lies corresponding to the oblique diameters of the pelvis either in front on the right or left side, or behind on the right or left, and its back may, in each of these positions, be directed toward the front or the rear. This division has also been abandoned because the position of the child has nothing at all to do with the diameters of the small pelvis, and the head, both in the beginning of labor and during its course, is turned neither toward the front nor the back but usually to the side. Another argument against Busch's theory is that it is neither theoretically nor practically of importance to establish various kinds of oblique presentations in which the head and the back of the child have almost exactly the same positions as in those according to Busch. H. F. Nägele has proposed only two positions of the child. The first position is that in which the back of the child lies in front and its head to the left (*a*) or the right (*b*); and the second is where the back is found behind and the head to the left (*a*) or to the right (*b*). The former is said to occur more than twice as frequently as the latter. This division is said by Hohl ("Lehrb.," II Aufl., 588) to be incorrect, inasmuch as the back is not most frequently turned to the front. Hohl asserts that the head lies most frequently toward the left, and that the left shoulder and the anterior surface of the child lies in front more frequently than does the right shoulder and the back. He therefore makes use of the position of the head as the chief factor in the division, and offers this classification :—

I. Head to the left { *a.* back to the front,
b. " " rear;
II. Head to the right { *a.* back to the front,
b. " " rear.

Hecker (*Klinik*, I, 128), has accepted this division. Only an accurate statistical investigation and the consideration of the origin of the positions named can teach us which classification is the correct or most rational one. This is the more called for since Hecker asserted, in opposition to Hohl, that it was still doubtful whether the back was turned more frequently to the front or behind. Schröder ("Lehrb.," p. 484) found one presentation with the head toward the right for 2.6 presentations with the head toward the left; one presentation with the back posteriorly for 2.9 with the back anteriorly, and (pp. 103–4), one oblique presentation in every 185.4 births; this was calculated from 314,657 labors. Späth found among 56 transverse presentations 39 cases where the back was anterior, and 17 where it was posterior. In literature I found 734 cases of oblique presentation in which the form of presentation had been very clearly defined. To these cases I add 130 of my own and 30 of my grandfather's, so that a total of 894 cases are made use of by me. Among these was found :—

The head to the left { back anterior, 280 cases,
" posterior, 166 " } 446 cases;
The head to the right { back anterior, 248 "
" posterior, 200 " } 448 cases.

I consider these figures to be sufficiently large to prove: (1) that the position of head to the left, and of the back to the front occurs most frequently; the next in order being head to the right, back in front; then head to the right, back behind; and last, and rarest of all, head to the left and back posteriorly. (2) The second fact which is established is that the position of the back to the front is more frequent—although not twice so—than the position with it posteriorly (528 : 366); the proportion being 1½ : 1. (3) That the head does not lie oftener toward the left than toward the right, but in about an equal number of times toward each side.

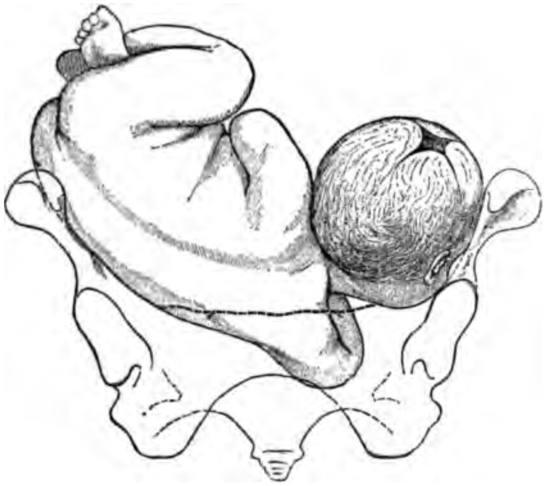
Hohl was therefore mistaken in rejecting Nägele's subdivision for the reason given above. His classification is, nevertheless, the best because, etiologically, it can be best vindicated. Oblique presentations arise most frequently from the sliding or shifting of the head from the pelvic inlet to one side. Since, in the great majority of cases, the back of the child is turned to one side and neither to the front nor behind, the passage of the head toward the right or the left requires but a very slight rotation of the child around its longitudinal axis in order to allow the back in this same head presentation to place itself anteriorly or posteriorly. The fact that the back turns decidedly more frequently to the front is explained by the difference in contour of the two uterine walls; the posterior being flattened by the vertebral column and thus lessening the space there, and also on account of its being inclined obliquely toward the front. Another reason is that these presentations occur most frequently with pluriparæ, especially those who have borne many times and who have pendulous abdomen, which gives the backs of the children plenty of room. On the other hand, it cannot be said that the two positions with the back anteriorly could be said to occur with equal frequency, because the breech situated in the fundus might descend as readily to the right as to the left; for the child's head, just the same as its back, has such a position that the latter is situated in front and the former above the conjugate diameter of the pelvis. If it be desired to enumerate the oblique presentations strictly in accordance with their frequency, we should arrange them thus:—

I. Head to the left, back anteriorly.
II. " " right, " "
III. " " " " posteriorly.
IV. " " left, " "

This division can hardly be objectionable. Hohl's division is better, etiologically, and more concise, but it admits of no designation by numbers. On the whole, it is generally advisable to designate the oblique presentations, not by numbers, but rather by a few words stating everything; for instance, to say instead of oblique presentation I *a*, to state that the head is left and back anteriorly (Fig. 82). This mode of designation is the more necessary, since in classifications hitherto used the same number has been used to designate quite different positions; for instance, Nägele's II *a* = Hohl's I *b*, I *b* = II *a* of Hohl. American authors, like Mme. Lachapelle, distinguish only shoulder presentations—the right and left with the back to the front or rear; they say that the right shoulder presents more frequently than the left (*Parvin*). This agrees with our figures given above (480 : 414).

Frequency of Oblique Presentations.—Clarke, in his private practice, found 1 among 347; Collins, 1 : 416; Ramsbotham (in the London Polyclinic), 158 : 48,996 = 1 : 310; McClintock and Hardy (comp. Arneth, "Geb. Prax.," 57), 1 : 257; Mme. Boivin, 1 : 256; Janson, in his private practice at Ghent from 1797–1837, found 30 hand presentations among 13,439 children, = 1 : 445.5 (Schmidt's *Jahrb.*, Bd. 24, 63). All these figures fully indicate the frequency of oblique presentations, and can only be accounted for upon the supposition that many cases of this kind had not been diagnosticated at the beginning of labor, or that they had been unnoticed, because we obtain different results after collecting the reports from obstetrical clinics showing large numbers of labors. We must, however, distinguish the frequency in the country and in the cities from that in the larger and smaller clinics. In Saxony, among 302,075 cases outside of the lying-in hospitals, there were 2195 (= 1 : 137) oblique presentations. Among 200,220 births in large lying-in hospitals there were 1506 (= 1 : 133) oblique presentations; among 20,219 births in small lying-in hospitals there were 216 (= 1 : 93). The large lying-in hospitals, such as those of Dresden, Vienna, Prague, Munich, Leipsic and Paris, come nearer to the proportion of the country and the cities. In adding both together, we find that there are 3701 oblique presenta-

FIG. 82.

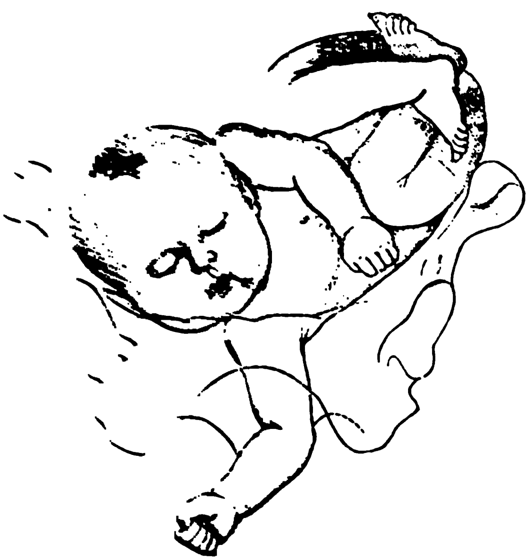


Oblique presentation. Head to the left, back to the front, right elbow presenting (I a).

[illegible] oblique presentation occurs in 136 deliveries. [illegible] Dresden and Munich I observed 100 oblique presentations [illegible] They are, therefore, much more frequent than according to [illegible] Mme. Lachapelle, Clarke and Collins. The cause [illegible] occurrence in smaller clinics is due to the fact that [illegible] presentations are brought into the clinic for the sake [illegible] many of these had been correctly diagnosticated and [illegible] would be lost in the enormous amount of material of larger [illegible] improvement of the presentation occurred sub partu.

[illegible] well-established fact that oblique presentations occur [illegible] pluriparæ and multiparæ than in primiparæ.

FIG. 83.



[illegible] head to the right, thorax to the front; prolapse of the right arm (II b).

[illegible] Nassau, among 1282 parturient women with oblique [illegible] primiparæ and 1147 multiparæ; that is, 1 : 8.5. [illegible] primiparæ to multiparæ is 1 : 3 (see Veit, *Monats-* [illegible] oblique presentations outside of the clinics should be found [illegible] often in multiparæ than in primiparæ. Among 576 [illegible] presentations in the clinics, there were only 86 primi- [illegible] 1 : 5.7). Thus, since in the clinics the [illegible] to multiparæ is 1 : 1.5, these (the presentation) [illegible] times more frequently in multiparæ. Among [illegible] presentations, there were 61 primiparæ, 238 [illegible] XVparæ. According to my former investigations (see "Klin. Beob.," p. 61), the multiparæ in the clinics are to the pluriparæ as 1 : 23.8, while here the proportion is 1 : 3, therefore the multiparæ are nearly eight times as frequent. This fact establishes the great influence that the shape, position and tonicity of the uterine muscular structure exert upon the child's presentation. Oblique presentations may occur when only a faulty shape of the uterus is present; cases of this kind have been reported by A. Geiss, Salert, Chiari, Braun, Späth, Lecluse, Schlechter, Simpson, O. Schöller and Faye. The proof that the faulty formation of the uterus is the real cause of the child's mal-presentation is furnished by the fact that the respective parturients presented an abnormal presentation in each delivery. It was so twice in Braun's case (uterus bicornis septus); in Späth's case (uterus bicornis) three times; Lecluse (uterus bicornis) three times; Geiss (uterus semiseptus unicollis), one abdominal and one oblique presentation; Faye (uterus bicornis septus), twice an oblique presentation.

We mention in connection with all this the fact that oblique presentations occur much more frequently with uterine myomata than otherwise. Süsserot found among 147 parturient women with this anomaly, 12 oblique presentations, or more than 8 per cent.; the child's presentation not even having been reported in more than half of the cases. In 48 cases of the kind Toloczinow observed 25 vertex, 13 breech and 10 oblique presentations. Such tumors may cause oblique presentations either by displacing the uterus so that the cervix does not properly adjust itself to the pelvic inlet, or the cervix may be displaced to one side by the tumor, or it may materially alter the shape of the uterine cavity and the relation of the diameters to each other. The protrusion of the tumor into the uterus may also prevent the child from assuming its proper position or its advancement in the usual manner. We shall refer to this again.

The pelvis is, furthermore, much oftener contracted in oblique presentation than when this condition does not exist. Michaelis has confirmed this statement by the strongest proofs. Among 776 hospital deliveries with wide pelves he found 1.2 per cent. of oblique presentations; in 73 hospital deliveries with contracted pelves, however, the rate was 5.4 per cent.; in private practice among 200 contracted pelves he found 71 per cent. vertex, 3.5 per cent. breech and 15.6 per cent. oblique presentations (Michaelis, "Das enge Becken," p. 183). The same fact is proved by Simpson's statistics; in 44 cases of Cæsarean section (performed on account of a well-marked contraction of the pelvis) there were found 68 per cent. vertex presentations, 20 per cent. breech and 12 per cent. oblique presentations. Pelvic contraction causes oblique presentations usually only in the last two months of pregnancy, or at the beginning of labor, the head being shifted to one side away from the obstructed inlet of the pelvis by the uterine contractions. Among my 130 cases the pelvis was contracted 32 times = 24.6

per cent., or at least twice the usual frequency. After these statements concerning uterine myomata, it cannot be doubted that ovarian tumors may also constitute a predisposition to the child's oblique presentation.

The best opportunity to pass from the consideration of the predisposing causes furnished by the mother to those originating in the child is furnished by *twin-deliveries*, in which, as experience teaches, oblique presentations are also uncommonly frequent. Sickel found among 1138 twins 51 = 1 : 22 in oblique presentations; and from the recent reports of the German obstetrical clinics I estimated the oblique presentations to be 106 : 1578, that is, 1 among 15.7 twins. It occurs much more frequently to the second child, which, after the expulsion of the first, sinks obliquely into the pliable and worn-out uterus; it may possibly be rapidly forced downward by spasmodic contractions, until its advance is checked by the lower child. The first child presents obliquely much more rarely, 13 : 789 = 1 : 60. It is a still rarer occurrence to find both children in the oblique position (5 instances among 789 twin-births). Abnormally large children are also frequently met with in oblique presentations; they as well as pelvic contractions constitute a predisposition, the presenting part easily finding some obstacle in the pelvic strait which causes it to glide to one side. Boys are oftener born in oblique presentations than girls. Among 282 children presenting obliquely there were 192 boys and only 90 girls, while the proportion is otherwise about 17 : 16; more than twice the usual proportion of males in this number. The cause of this fact has not yet been established; the differences in size and weight between boys and girls are not great enough alone to account for the fact. It has already been stated that the prolapse of extremities alongside the head (as, for instance, of one or both hands), formed a predisposition to oblique presentation. Such an origin for the presentation has been accurately noted by Michaelis, who saw a shoulder presentation gradually develop from a lateral obliquity of the head, with prolapse of a hand and the cord, as the arm descended into the pelvis. Any abnormal enlargement of the child's body produced by faulty formation, or due to intra-uterine diseases, will also predispose to oblique presentations.

The same is true with regard to double monstrosities and large tumors on certain parts of the child's body (*Caldwell*). The umbilical cord may also cause oblique presentations. Lange and Doutrelepont consider that an abnormal shortness of the cord may be a cause of this presentation. There are cases, however, in which an almost complete absence of the cord has been found in a head presentation (*Sclafer*), and this will depend on the situation of the placenta. At Munich I observed a case in which the cord, 28 cm. in length, was coiled once around the neck and may thus have caused the oblique presentation (*Semiannikoff*, l. c., p. 28). Sometimes the fœtus presents with a large umbilical hernia (case of Penjou and Spessa). In 201 transverse presentations Schöller saw one case with rupture of the umbilical cord, and one where the fœtus had a large tumor of the liver with ascites. Leclerc found a fœtus in the oblique presentation, head to the left, abdomen in front, with a tumor at the coccyx weighing 950 gm. and as large as two fœtal heads (*Lyon Med. Jour.*, 7, 1805). An uncommonly small fœtus and its early death may also be an important factor in the genesis of oblique presentation. Such a fœtus does not offer a proper resistance to the uterus, and is therefore more easily compressed than dislodged and moved into a better position. By its death it has lost the elasticity which might have brought it into another position after the cessation of the compression. Thus we frequently find macerated fœtuses in oblique presentation. Schöller found them 20 times in 201 oblique presentations; the author 75 times (8.3 per cent.) in 883 cases; Braun, 7 times in 70 cases; Späth, 7 times in 176 cases. Duncan found 94 abnormal presentations among 527 cases of macerated fœtuses = 1 : 5; among these were 6 oblique presentations = 1 : 88.

For the same reason oblique presentations are said by Simpson to occur ten times as often with prematurely born children as with fully developed ones. In my last 100 cases of oblique presentations there were 24 premature and 13 non-viable children, or premature deliveries in more than one-third of my cases.

Another important anomaly is furnished by placenta prævia centralis and lateralis. Simpson noted among 366 cases 15 cases = 1.21 (*Lachapelle, Collins, Wilson, Ramsbotham*): Schöller, 16 : 201 = 1 : 12 (11 lateral and 5 central).

Among the 219 oblique presentations in the oft-mentioned clinical reports, I found 18 cases of placenta prævia; and among 178 cases of placenta prævia there were 22 cases of oblique presentation. The attachment of the placenta over the internal os not only changes the shape of the uterus, by causing it to become more spheroidal, but it also obstructs the entrance of the head or breech, and causes them to glide away from the lower end of the uterus.

A large quantity of liquor amnii frequently contributes to the development of oblique presentations. Hydramnios was found in 10.8 per cent. of all the cases, because it distends the uterus like a ball, permits an abnormal mobility and frequently causes disease of the child, the latter being either very small or suffering from ascites.

Such are the predisposing causes of oblique presentation; and they are to be considered as such because in themselves they are not sufficient to bring on such an abnormal position. The real exciting causes are, in the first place, the contractions which force the presenting part of the fœtus above the pelvic inlet or the internal os against the obstacle, and thus displace or compress it. Secondly, a sudden premature escape of the liquor amnii at a time when the child is in a state of transition; the fœtus now becomes fixed in the uterus as it grows smaller and is forced forward. Thirdly, violent movements of the gravida or parturient, a rapid rolling about in the bed, sudden shocks, such as a fall, etc. It cannot be doubted that just as a proper posture of the parturient materially assists in improving an oblique presentation of the child, so a faulty position of the parturient on her side will greatly contribute to the said presentation, inasmuch as—especially when the abdomen is pendulous, owing to a strong lateral displacement of the fundus—the breech, by its displacement, throws the head away from the pelvic inlet.

My statements regarding face presentations and prolapse of the umbilical cord—proving that they are rarely due to one cause alone, but to the co-operation of several—also holds good concerning oblique presentations, since they are likewise closely related to face presentations as regards their frequency and other etiological conditions. Semiannikoff has ascertained that in my last 100 cases there were no less than 35 combinations, and that in one-third of all cases, combinations of three or more factors have been proven to exist. The causes which tend to a most frequent production of this anomaly are, a considerable size of the child with a pendulous abdomen in multiparæ, and a premature discharge of the waters. Frequent determining causes are to be found in contracted pelves and placenta prævia.

An especial cause for the origin of an oblique presentation from a longitudinal position during labor itself, is to be found in rupture of the uterus, where the child's extremities escape through the rent in the uterine wall; this has been observed by Arneth ("Geburtshülfliche Praxis," p. 180).

We must not overlook the fact that some women have oblique presentations regularly or almost in every labor—three, four, five times in succession (see Hohl's case, *Monats. f. Geb.*, II, 498).

My grandfather delivered a woman with oblique presentations three times in succession. She had previously had five easy and normal confinements. Hildreth attended a woman who was delivered of her first child in a head presentation, and subsequently had four oblique presentations in succession. Meissner relates a case (*Monats. f. Geb.*, IX, 16) of a woman who was delivered of her first child in a head presentation, but had to be delivered of all the other children by version in consequence of oblique presentations. Among my last 100 cases I observed three women who had an oblique presentation at least once before.

We have already ascertained the faulty shape of the uterus to be a cause of the so-called habitual oblique presentations. We must add that a considerable contraction of the pelvis also favors the repetition of a faulty position, because the preceding birth has very often materially altered the shape of the uterus, the elasticity of the abdominal wall, and the dilatability of the cervix; and also because the subsequent children of such women are larger and heavier than the first, and thus the obstacle is increased.

The course of labor in oblique presentation.—Since, in oblique presentations, the uterus is always—or at least with very rare exceptions—distended more transversely than is usual, and as the tissues corresponding to the child's head are stretched the most, the parturient, as soon as the contractions set in, will feel more violent straining pain, especially in the parts which are wrenched the most. The pains are thereby excited at the onset and are nearer together and more intense than is the case with a longitudinal position at the commencement of the first stage. The great stretching and pressure which are exerted upon the lower uterine segment at points corresponding to the pelvic walls, frequently cause the woman to assist the uterine contractions, by following the irresistible impulse to bear down. These contractions, however, produce only a very slight and slow effect upon the dilatation of the cervix, because no large part of the child enters the os uteri, and also because the fœtal membranes in some places are firmly wedged in between the uterine wall and the child's body, and are only lightly pressed upon in other places, and hence do not enter the mouth of the uterus uniformly, but are frequently twisted and sausage-shaped. Straining on the part of the woman and the unequal descent of the membranes cause their premature rupture, which is the more dangerous for mother and child, inasmuch as a large quantity of the liquor amnii may flow off at once, because the cervix is not sufficiently blocked up. The intense compression of the uterine wall causes a swelling of the soft parts, as one lip of the cervix, the vagina, and sometimes the vulva. The pains, straining, and the incarceration of the uterine walls frequently make the parturient feverish. The reddened countenance, increased temperature, quickened respiration and free perspiration often produce the impression that delivery is near its completion, and that the head is on the point of escaping, while, in fact, the woman has scarcely passed the beginning of the first stage of labor.

The pains increase after the rupture of the membranes; in some cases they become very severe, while in others they cease for a time. These may now assist in correcting the position of the child. This is known as *spontaneous version*, although this name is not so fitting as the term *natural version*, because during this procedure the child is passive and the change of position is accomplished by the uterus alone. This event, sometimes inaptly called *spontaneously induced* (selbsteinleitung) (Birnbaum, *Monatsschrift*, II, 321), may take place either above the pelvic inlet, or after the entrance of a fœtal part into the small pelvis, or even in the pelvic outlet. It occurs very frequently in the pelvic inlet, especially where the membranes are still intact, or the fœtus is still movable and the pains are not too frequent or too strong. According to Haussmann's investigations, such a labor lasts, on an average, 32 hours—much longer than usual. In the beginning the pains are generally feeble, often spasmodic, rarely normal; they sometimes suddenly become vigorous and rapidly recur; the presenting fœtal part is pushed away from the os, and the head or the breech appears above the pelvic inlet; the pains continue in intensity, and, as a rule, expulsion quickly follows.

In 45 shoulder presentations in which this event occurred, the head lay 8 times to the left, 22 times to the right; 15 were undefined oblique presentations, and in two-thirds of these cases an arm, elbow, hand or the cord was lying over the os. This process goes on more quickly before than after the rupture of the membranes. It is also far less serious for the mother and the child in the former case (in ten cases both remained alive and well) than after the rupture of the membranes (two mothers died out of 38, and 13 children).

This partial version has to be distinguished from a total version, where, for instance, a head presentation has been converted into a breech presentation, and *vice versa*; but we have not to deal with the latter here. Haussmann is certainly mistaken in his opinion, which is based upon his researches in literature, that spontaneous version is five times less frequent before than after the rupture of the membranes; for cases of spontaneous version at the commencement of labor certainly occur before the physician arrives, or at least before his examination. At least, we must assume this to be highly probable, because the correction of positions often in the very last month of pregnancy has been clearly established. Carl Braun asserts—and I think he is right—that of 100 oblique presentations a spontaneous version into a longitudinal position takes place in 70 during pregnancy. It is worthy of note that partial natural version into a breech occurs in 75 per cent. after the rupture of the membranes, and in 80 per cent. into a head before their rupture, and that the latter occupies only half as long a period as the former. As to the children, I must state that they are generally fully matured, and with regard to the maternal pelvis, it is usually found normal and often very wide. This natural assistance in oblique presentations has been distinguished from the so-called *spontaneous evolution*, in which, by means of the enormously increased pains, the child, together with the presenting shoulder, is forced through the pelvis with the body bent together, so that the shoulder and the thorax precede, and the breech is then delivered and is followed by the head. In closely examining this process, we find the following mechanism: Vigorous pains after rupture of the membranes impel the shoulder (usually preceded by an arm) through the cervix and down upon the pelvic strait; the arm often appears at the vulva; the laterally situated head is drawn toward the front over the symphysis by the shoulder, which is strongly pressed against the symphysis pubis, by means of the enormously stretched neck, and the breech is then wedged into the small space from behind by the fundus uteri. While the shoulder becomes wedged underneath the arch of the pubis, the tremendous pains force the breech down in front of the sacro-iliac articulation along the body into and through the vulva; then follows the posterior shoulder, and, finally, the head. This process is, therefore, but a natural version, the difference consisting merely in the circumstance that the turning around the longitudinal and transverse diameters of the child's body does not take place above the inlet, but in the mother's pelvic outlet only.

The conditions under which this kind of expulsion takes place are (comp. O. Simon, p. 44): a fully-dilated cervix, a well-prepared, soft, parturient canal, and vigorous pains, with a shoulder presentation of the fœtus. It is favored by a wide pelvis (twin birth), by numerous previous deliveries, by the death of the fœtus and its small size, and, finally, by a normal attitude of the lower arm. Pelissier observed it in a primipara 32 years old. Although the child's neck is subjected to a very severe stretching, and the trunk to enormous compression, yet some of the children thus expelled survive. According to Simon, 69 were dead, 16 had been dead a long time, 10 certainly died during labor, but 14—more than 13 per cent.—were born alive. Such cases were observed by Vezin, Bartsch, Braun (2), Champion (2), Chailly, Kuhn, Hirsch, Hinterberger (2), Chiari, Delmas and Betschler. Four of these children died soon after delivery, but 10 per cent. remained alive. The puerperium proceeds favorably for the mother in most cases; of 36 women, 33 are reported as getting on well, and 3 as having died. As to the frequency of this process, among 332 oblique presentations, 28, or 8½ per cent., cases of so-called spontaneous evolution have been observed; 4 = 14 per cent. of these children were born alive.

The expulsion of the child with its body compressed—the partus conduplicato corpore—is a third termination of labor with oblique presentation, often accomplished by nature by means of great exertions. It is to be clearly distinguished from the expulsion of the fœtus described above, for in this form of expulsion there is no turning around the transverse axis of the child and no correction of the position, but an expulsion of the presenting part, arm or shoulder, followed by that of the neighboring parts, that is, the thorax with the head and neck firmly pressed into the thorax or abdomen. I have observed this four times among my 130 cases, but it was found only once among the 332 cases mentioned above. It is much rarer than natural version in the pelvic outlet, but it requires the same conditions and favoring circumstances. The child will always die, and, as a rule, is already dead, because of the great pliability which is requisite for its accomplishment.

In my first case the fœtus was only 6½ lunar months old. In Cederschjöld's case the left shoulder was in the pelvic outlet, the head was situated posteriorly on the right side, the right shoulder was deeply pressed down into the thorax, the neck was stretched so much that the head with the right ear had been pressed into the abdominal wall of the child, while the thigh lay above. The fœtus, a dead girl, weighed two pounds and was fourteen inches in length. Lowry reports a similar case.

The condition of the uterus in the two last described varieties of the forcible expulsion of the child is very characteristic. The lower uterine segment must be abnormally distended and very much thinned, the "contraction ring" pushed well upward, the upper part of the uterine body small and hard, in other words, the whole organ is turban-shaped; the round uterine ligaments are tensely stretched, and rupture of the uterus in such cases is liable to occur at any time.

A number of *complications* may render the course of labor with oblique presentations still more unfavorable. The first to be mentioned is *presentation and prolapse of the umbilical cord*, which have previously been discussed in full, in connection with prolapse of the umbilical cord.

Hemorrhages during delivery are also complications of oblique presentations, though much more rare. We have already mentioned in the etiology that placenta prævia often occurs with such presentations, but hemorrhage may also occur without an extremely low insertion of the placenta. If, after the escape of the liquor amnii, the uterus becomes more and more contracted around the child, and its longitudinal diameter becomes smaller than before, the upper and lower ends of the placenta may thus approach one another so closely that a premature detachment begins. But even without such a detachment the compression of the placenta necessarily becomes so great as to endanger the child's life to a greater or less degree—a fact not to be lost sight of in accounting for the frequent death of these children. Among 195 cases there were 9 (4.5 per cent.) instances of hemorrhages of this kind (cases of Richter in Halle, Chiari, Arneth and the author).

Abnormally strong and tetanic contractions of the uterus in oblique presentations—the origin of which has already been partly alluded to—are very fatal. They not only kill the child by exerting a dangerous degree of compression on it, by pressing upon or prematurely detaching the placenta and by constricting the cord, but they also bruise the maternal structures through the child, thereby exposing the parturient to the danger of rupture of the uterus, and, finally, render the introduction of the hand so difficult that even an expert is wholly unable to improve the fœtal presentation. As a rule, it may be said that the power of the uterine contractions increases in proportion to the resistance, and that, therefore, the firm constriction of the fœtus becomes the more probable the longer the time that has elapsed since the escape of the liquor amnii. With a large child and violent pains, the contractions may often attain an unusual and even dangerous intensity very soon after the rupture of the membranes.

As the liquor amnii often passes away at the commencement of labor, and a frequent and thorough examination with several fingers becomes necessary, it frequently happens that air enters the uterus and surrounds the child, taking the place of the liquor amnii. We hear, therefore, during the examination the noises caused by the influx of these gases, and also those caused by their escape during the pains, the latter being apt to be associated with a foul odor. Their existence may be shown by percussion and palpation of the body of the uterus; the abundant escape of these gases is readily perceived both by the sense of smell and of hearing during the extraction of the child. This air may lead to a decomposition of the fluids which remain in the uterus; if the fœtus be dead, it may set up a rapid process of decomposition in it, and the gases produced thereby may cause a tremendous expansion of the uterus, if the presenting fœtal part is tightly grasped by the cervix (tympanites uteri). The child, swollen by the putrid gases, may constitute a very considerable obstacle to delivery. The gases may also be forced into the maternal vessels and cause the death of the parturient even before the termination of labor by air embolism. A case of this kind was reported by Depaul in 1856. In one of my essays (see *Berlin. klin. Wochenschr.*, 1868, Nr. 9) I have myself called attention to the dangers of this entrance of air.

The other complications, especially contracted pelvis, placenta prævia and twin pregnancy, have already been alluded to in the etiology. The contracted pelvis in oblique presentations predisposes particularly to a *laceration of the uterus*, inasmuch as a contusion of it is produced by the child's being wedged into the pelvis at the site of the very prominent promontory. In such a case, the woman is usually lost, and often dies undelivered. In fact, unless the parturient receives some assistance in an oblique presentation with a large child, natural version or delivery by conduplicato corpore does not always take place, but many women die undelivered, of hemorrhage from a premature detachment of the placenta, of exhaustion or septicæmia, with premature death of the child.

Hugenberger found rupture of the uterus three times among 77 cases of oblique presentation; Braun twice in 70 cases.

In conclusion, I will give a résumé of the most common complications with oblique presentations. I found among 500 cases of oblique presentations: premature rupture of the membrane, 68 times = 13 per cent.; a narrow pelvis, 50 times = 10 per cent.; prolapse of the umbilical cord, 48 times = 9 per cent.; placenta prævia, 38 times = 7.6 per cent.; twins, 51 times = 10.2 per cent.; prolapse of both extremities, twice; of the rarer ones, hydrocephalus was met with once, rupture of the uterus 4 times; total, 217 = 43 per cent.

Diagnosis.—In examining a faulty fœtal presentation, we must consider the position and shape of the uterus, the position of the separate parts of the child, the stage of labor and existing complications.

In the *external examination, the form and position of the uterus*—by reason of its great transverse expansion and its short vertical diameter—must first of all give rise to a suspicion of an oblique presentation of the child. There are, however, cases of shoulder presentations, to which Christie (*Schmidt's J.*, Bd. 125, 97) has called especial attention, in which the child lies somewhat more lengthwise, its head being bent more posteriorly above the ilium, and its breech and feet being in the fundus. In palpating the abdomen there will usually be felt at some part of the uterus a large, round, hard, sometimes movable and distinctly circumscribed body, the head of the child; on the opposite side a soft, irregular body, the breech, about which the lower extremities are occasionally felt to move; between these it will be possible to trace the broad surface of the back, if it lies anteriorly; but if it lies posteriorly, several different extremities may be felt. The deep lateral position of the tuberosities, before the breech has been felt, renders the presumption probable that it has glided to one side from the fundus, and the unusual position of the breech indicates a corresponding position of the head. The *cardiac sounds* of the child in oblique presentation are heard either at some unusual place, or not all, even when the child is alive. If the back lies to the front (see Fig. 82), we usually hear the cardiac sounds in the *median* line, *close to the symphysis.* In the other two cases, for example, Fig. 83, especially if labor has commenced, and, as a result of this, the presenting part has already descended lower, they are not as easily heard, because we cannot readily get at the back of the fœtus; this is especially the case if the head lies to the left and the left shoulder presents. If the cord presents, its pulsations afford a very convenient means of informing ourselves as to the condition of the child; but this occurs only in one-tenth to one-fifth of the cases. It is, however, requisite, on account of eventual operative interference, and of the prognosis for the child, to ascertain, as accurately as possible in oblique presentations, the point where the cardiac sounds are heard most distinctly, and to count the pulsations from time to time. The radial pulse in a prolapsed hand may serve to inform us as to the condition of the child.

During the *internal examination* at the commencement of labor, we sometimes find the vaginal vault and the cervix still empty, and only with difficulty we discover a round, uneven or movable extremity in the pelvic inlet. If, however, some parts of the fœtus have entered the pelvis, the shoulder is recognized by the clavicle and scapula, the hand by the movable abductible thumb, and we can distinguish which it is by trying to shake hands. If the examining finger and the presenting hand fit together, it is the same; if not, it is the opposite. In some cases an arm has not only passed into the vagina, but has escaped out of the vulva before the obstetrician's arrival. The attitude of the hand, under these circumstances, often readily indicates the entire position of the child, unless traction has been made upon it; for the head is found on the side toward which the thumb is directed; the feet lie on the opposite side; the abdomen is situated on the side toward which the palm of the hand is directed; the position of the back corresponds to the back of the hand. The forearm, however, is sometimes rotated toward the palm of the hand, which fact may lead to an error in the diagnosis.

We should not, therefore, content ourselves alone with this way of making out the presentation, but should also thoroughly palpate the shoulder and axilla, and from this point map out the situation of the feet and conclude from the position of the convexity of the shoulder where the head of the child is. The relation of the scapula to the clavicle, and the presenting arm will decide whether the back is turned anteriorly or posteriorly.

We must, furthermore, examine the presenting fœtal part with reference to its *size*, *swelling* and *mobility*. The size should be examined in order to ascertain, approximately, the development of the child. The swelling furnishes a means of estimating the force of the uterine contractions and the duration of labor since the escape of the liquor amnii. Vesicles are sometimes found upon it; discolorations, varying in tint from a dark blue to a brownish-red, indicate an enormously rigid constriction of the part, a fact of importance if any operation is to be performed. In regard to the mobility of the part, we should examine whether the presenting part is still movable or has an undue amount of mobility. In a case of prolapse of an arm in an oblique presentation, in which a physician had for some time made vain attempts at version, I diagnosticated a fracture of the upper arm from its unusual mobility, and allowed the attending physician to feel it before I began my operation.

If from the large presenting part which is situated in the os uteri an extremity passes off whose end cannot readily be reached, and it can be examined only as far as the region of the knee or elbow, it is advisable—when the position of the child cannot be clearly ascertained—to draw this part down before undertaking any operation, because, if it is a foot it will be a good handle to make necessary traction upon; if it is a hand, it may serve to complete the diagnosis and will materially facilitate the subsequent loosening of the arms by passing a sling around it. In those cases in which a natural version may still be expected, as when an oblique presentation undoubtedly exists and the child is still movable, the drawing down of an arm would not be permissible, because the spontaneous improvement in the presentation may be made more difficult by the presence of an arm in the vagina.

If a long time has elapsed since the rupture of the membranes and the deeply situated presenting part has been wedged into the small pelvis by the strong pains, partly on account of the swelling of the soft parts and partly because of their enormous tension, this part may almost attain the rounded shape and hard consistency of the head; and, as in these very cases the external examination is void of results owing to the violent contractions of the uterus, a wrong diagnosis may be made and a head presentation be supposed to exist. This occurred to Metzler. I have also observed a case of the kind. I mistook the angle formed by the last rib with the vertebral column for the small fontanelle, which at the time of my arrival was about to escape from the vulva. I was very much surprised at the appearance, first of all, of the trunk, then of the right shoulder and next of the thorax with the compressed head of a child, in appearance hardly more than 6½ lunar months old, and, as a matter of course, dead.

If the diagnosis in such cases cannot be accurately made by one or two fingers, the introduction of half the hand is to be recommended, especially before commencing any operative measures. A diagnostic error in regard to the side of the child which presents is, on the whole, more excusable and practically of less consequence than an error in the diagnosis of the side in which the head is situated; still the latter error, for him who, during a version, keeps close to the presenting fœtal part and passes from this to the breech, has not as much significance as many attribute to it.

If the presenting part has not been positively recognized as the shoulder, we should first of all look for two attributes, the want of which distinguishes this presentation from two others easily confounded with it. We must think, in the first place, of the more frequently occurring *breech presentation,* and palpate everywhere in order to feel a pointed, triangular bone, and more particularly the anus. In such cases exploration with *both* hands should not be neglected; if no portion of the presenting part can be designated as the coccyx or anus, we should then think of a *face presentation* and therefore look especially for the mouth, which may be easily recognized by its size and the presence of the tongue in it.

In the examination, moreover, the period of labor, the condition and size of the os, the effect of the pains and the position of the presenting fœtal part should all be considered, all of which are very important for any prospective operation. The size of the os uteri does not always correspond to its width; as a rule, it will adapt itself to its contents, most often an arm; by traction on this we shall obtain an idea of its flexibility and dilatability. We must not simply regard the external os, but the whole cervix and the internal os. We should explore during the pains, in order to ascertain their effect, whether the presenting part advances, or is dislodged or becomes more swollen, and whether any active movements of the child may be felt through it. Many cases in literature prove that the fatal results for the mother or the child are a consequence of neglecting to make this investigation, or that the operator resorts to version without having come to any definite conclusions regarding the condition of the cervix, the pains, and the firmness of the incarceration of the presenting part in the small pelvis.

Since in oblique presentations the expansion of the lower uterine segment frequently reaches an extreme degree, and since this may project like an inflated bladder above the symphysis, we should carefully ascertain the situation of the "contraction ring" and the condition of this segment of the uterus, and examine the tension of the round ligaments.

The *complications* to be considered in the examination have been mentioned before. Their differentiation need not be discussed here; as a rule, they are easily recognized. Their etiology is not only interesting, but also important, because they may exert a decided influence upon our actions, since they are determining factors in regard to the time for, as well as the kind of, operation. A version should never be undertaken without previously ascertaining the precise size of the pelvis, because the selection of the method of operation, as to whether cephalic or podalic version by one or both feet should be performed, depends in part on the condition of the small pelvis.

Prognosis.—If an oblique presentation is found in pregnant women without serious causes—such as narrow pelvis, placenta prævia, uterine or ovarian tumors—we should be careful not to inform her of her condition, as in most cases it causes unnecessary anxiety. Most of the oblique presentations are converted, before or at the commencement of labor, into head or breech presentations. The prognosis, on the whole, is good in oblique presentations when the pelvis is wide, the child movable and not too large, and the membranes still intact. Sometimes in such cases a suitable position of the patient alone suffices to improve the child's presentation. The longer the labor has lasted the more serious the prognosis becomes. It depends, first, on the size of the child. A small, macerated fœtus, not yet seven lunar months old, may be expelled in an oblique presentation without any injury to the maternal soft parts. After the seventh month, however, we should, as a rule, rely no longer upon the natural version of a living child, because the mother may be exposed to great danger by it, although the puerperium has terminated favorably in many cases. Still less should we wait for a delivery by conduplicato corpore. We have not to deal here with the prognosis of the various operations, but only to state generally the result for the child's life in oblique presentations. According to Oesterlen, the proportion of stillborn to living children is as 1 : 32.4; about 3 per cent. of the children are therefore stillborn (these figures are the result of calculations based upon more than ten million labors). In 883 children with oblique presentations, we found 72 macerated or dead *before* delivery = 8⅓ per cent. Deducting these, there remain 808 children who were living at the time of labor; 273 = 33 per cent. of these *died* during labor, and 525 = 66 per cent. were born alive. These presentations, therefore, caused eleven times as many deaths during delivery as in normal cases. We must, however, make some allowance for the various complications of oblique presentations, the worst of which is the prolapse of the umbilical cord, which has already been discussed on page 368.

The prognosis for the parturient is more favorable, although still serious. Arneth lost 3 per cent., Braun 11 per cent., Späth 9.5 per cent., the author 3.8 per cent., but these results were obtained before the introduction of carbolic acid and sublimate. Among 378 cases, 21 = 5.5 per cent. parturients died.

In comparing these figures with the results of private practice, it is to be noticed that, among 1852 women with children in oblique presentations, 106 or 8 per cent. died after internal version (*von Franqué*). In Wurtemberg more than three-fifths of the versions occurred with oblique presentations and one mother died in about every seventeen deliveries = 6 per cent. (*Riecke*). The results are, of course, very unfavorable with physicians in private practice who are called quite a distance into the country to attend cases of oblique presentations. My grandfather was in such a position, as he resided in Westphalia in a neighborhood where contracted pelves were very frequent, owing to rachitis and osteomalacia. Of 35 women, on whom he was compelled to perform version, owing to oblique presentations, he lost 5 = 14 per cent.; one of them died undelivered. This percentage is still favorable, in comparison with that of the St. Petersburg Institution, which was 18 per cent. Among the 12,254 deliveries noted by Theopold in the Principality of Lippe in 1880–83, 93 oblique presentations occurred, in which 21 children, = 22.5 per cent. were stillborn and 4 mothers = 4.3 per cent. succumbed.

We are forced, then, from these figures, to the conclusion that in the maternity institutions the rate of maternal mortality with oblique presentations and internal version, on an average, is two or three times higher than after natural deliveries, and that in private practice, where the mortality only amounts to about 0.6 per cent. of the lying-in women, six or seven times this number succumb after internal version with oblique presentations.

According to Haussmann 10 per cent. died after spontaneous version, and Simons reports 8 per cent. of deaths in cases of so-called spontaneous evolution. The latter figure has probably been calculated from too small a number of cases, because in more than two-thirds of the cases (89 out of 125) no result for the mother has been reported. Of the children 44.6 per cent. died during and after spontaneous version and 80 per cent. during and after spontaneous evolution. Deliveries in which the body of the child was compressed, as far as I know, have only been observed with dead fœtuses, and in them the mother has been in as much danger as in natural version at the pelvic outlet. All three kinds of natural help are, therefore, more dangerous for the mother and far more dangerous for the child, than the artificial improvement of the presentation by version, with or without subsequent extraction.

Treatment.—Prophylaxis.—We have seen that multiparæ with pendulous abdomens often have oblique presentations of the child. It is therefore the duty of the physician in such cases to secure a correct position of the uterus, with relation to the inlet of the pelvis, by means of a properly applied binder from and after the middle of pregnancy. This will diminish the active movements of the fœtus and those of the uterus, so often occurring in cases of pendulous abdomen. Toward the end of pregnancy he will also forbid all movements associated with a strong jarring of the body; and advise the patient also to avoid everything which may cause a sudden and premature discharge of the liquor amnii. Intercurrent diseases, such as bronchial catarrh and diarrhœa, must not be overlooked in the latter months of gestation. This applies especially to women who exhibit one of the above-mentioned predisposing factors of oblique presentations, and, above all, to such as have previously had an abnormal or faulty presentation of the child. If, nevertheless, he apprehend that a faulty presentation of the child may arise, he will advise the gravida to go to bed as soon as she begins to feel labor pains, to abstain from any premature expulsive efforts, and to send for the midwife and a physician at the same time.

When an oblique presentation has been discovered in a pregnant woman, the first question is whether to rectify it at once by the proper manipulations. This is entirely unnecessary in the majority of cases, because in more than two-thirds of them the presentation is changed by the natural forces into a longitudinal one, in the last period of pregnancy. There is, moreover, no guarantee that the improved presentation produced by the manipulations will be permanent up to the time of delivery; on the contrary, the improvement will probably be merely temporary in the majority of the cases, because the various predisposing causes cannot be changed, and still less can they be entirely removed. Yet an attempt should be made; it may show what may be expected later on. If such an attempt should be made, we must avoid undue pressure and manipulations extending over too long a period of time. If it be not soon successful, we had better desist; the attempt may be repeated, but it will be well to advise the woman to assume a definite position in bed for the remainder of pregnancy, that is, as a general rule, on the side toward which the head of the child has deviated.

Concerning this very definite rules were given by Soranus and Moschion:—

> "Si autem præter naturam positus fuerit infans, quid obstetrix facere debet? Utique ut prius eum secundum naturam componat scilicet parturiens competenter in lecto collocanda est, ut altum habeat caput et paulo durior sit stratus, et si in priorem partem ab orificio matricis pecus infixum est, supina est collocanda. In genua etiam et ad dentes si retro ab orificio matricis infans est. Si vero in latere dextro est, in sinistrum latus collocare, si in sinistro in latus adversum." (*Sorani* Gynæc. ed. *Val. Rose*, 1882, p. 83; 84.)

The presentation having been improved, we should, in the next few days, frequently examine to ascertain whether the improvement remains constant; if it should not, it may be tried again, but it is best to abstain from too frequent manipulations, because they may cause premature delivery.

It is different, however, if *labor has already commenced;* the question now is whether to wait for a natural version before or after the rupture of the membranes, and under what circumstances. This question must be positively decided in the negative, after what has been said under the prognosis. Even if the child is small and movable, the liquor amnii rather abundant, the pelvis normal and the mother healthy, and if there is no reason to hasten the delivery, we should not remain idle and leave everything to the activity of the uterus. If this holds good for the cases in which the child has not yet been forced into the small pelvis, it applies with still greater force to those cases in which the engagement of the child has already taken force after the escape of the liquor amnii. Under such circumstances we could not safely predict a favorable issue for either mother or child, excepting, of course, in those cases in which the child has not yet reached twenty-eight weeks, or has been dead a long time, its body then being easily compressed. Unless the macerated child be too large and resistant, its expulsion may be left entirely to nature and at most only hastened by traction on the presenting part, when necessary.

In all other cases, we shall try to improve the child's presentation as soon as possible, whether by external or internal manipulations, or by both combined. We shall endeavor to bring down over the os some other part than the presenting one, some terminal point of its longitudinal axis, as the head or breech. Since this is impossible without displacing the presenting part along with the fœtus, and without a simultaneous rotation of the child around its sagittal, longitudinal and transverse axis, this change in the presentation is called a version. It will be described in the section on obstetrical operations.

If version is no longer possible, decapitation or embryotomy is indicated, according to the circumstances of the case; only in rare cases will it be possible to do an extraction by the prolapsed part without crushing the child. All of these operations will subsequently be described more in detail.

CHAPTER IV.

Disturbances of Labor due to a Faulty Shape of the Child in Consequence of Diseases, Deformities and Faulty Size.

(A) In consequence of a faulty condition of its head.

1. Hydrocephalus.

LITERATURE.

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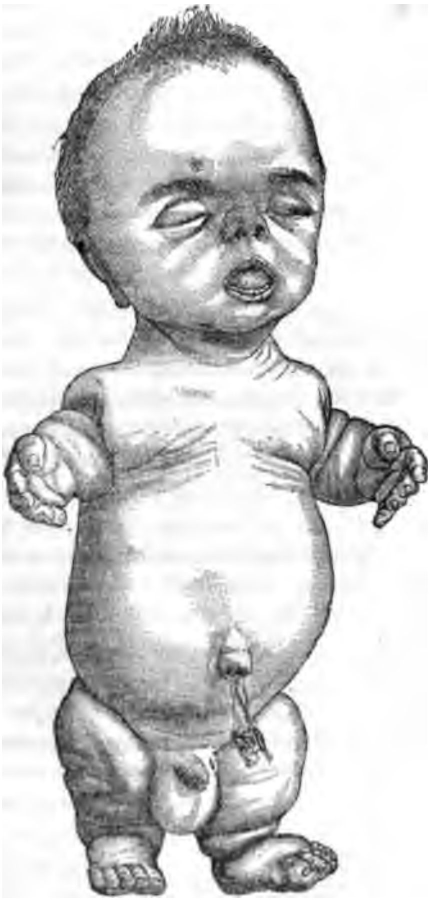
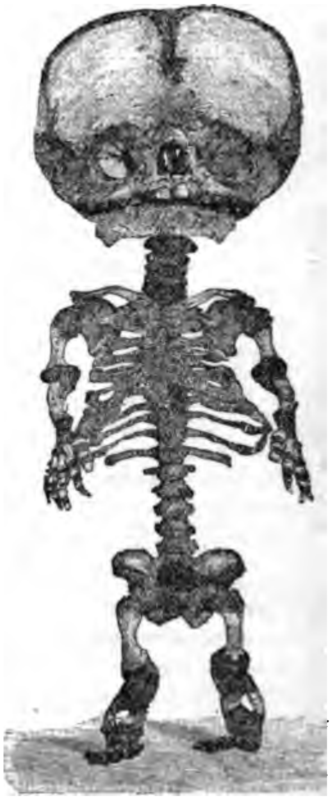
By congenital hydrocephalus I understand an accumulation of serum, ranging in quantity from a few tablespoonfuls up to 4 kgm., generally found in the ventricles, especially in the lateral cavities; although in very rare cases there may be a serous effusion into the arachnoid sac, which may likewise produce a considerable enlargement of the skull. The former, hydrocephalus internus, is surrounded, in its slightest degrees, by normally developed bones, sutures and fontanelles, which are separated about their natural distance from each other. The brain may be regularly developed, but is very much enlarged. In the higher degrees, the ventricles are changed into large sacs with thin cerebral walls, the convolutions of the hemispheres are obliterated, the bones lie far apart and are connected together by soft cuticular bridges. In the highest degrees, the whole skull-capsule is a soft sac, filled with fluid, in which traces of brain only exist at the basis cranii. If this sac bursts and the serum is discharged, the ruptured membranes become adherent to the cerebral remains at the base of the skull and we then have a condition which is called anencephalus or hemicephalus.

Fig. 84.



Mature Fœtus. Micromeles. Hydrocephalus. Ascites.

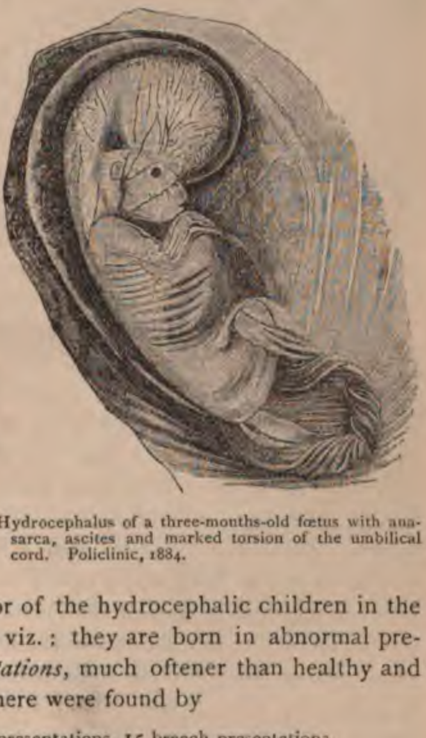
Fig. 85.



Skeleton of the same. Two upper incisors. Broad thoracic base.

As regards the frequency of this disease of the fœtus, Sickel (*Schmidt's Jour.*, Bd. 104, 109) found it 11 times among 65,581 hospital deliveries; that is, one in 5962. I have observed 8 cases of this kind among 15,000 deliveries, and my father 4 among 650, almost all of which were abnormal. It is a noteworthy fact that women sometimes give birth to several hydrocephalic children in succession. Castelli (see *Boehr*) saw a woman give birth twice to such a diseased fœtus; Göhlis reports six and Peter Frank seven hydrocephalic children from one mother. An anomalous condition has, however, rarely been discovered in the woman's body; only West and Olivier considered dropsy of the mother as a cause. On the contrary, other anomalies are observed in the fœtus and the parts which surround it. Of 60 cases of hydrocephalus, 18 were associated with lumbo-dorsal spina bifida. In many cases (5 : 60) the fœtus had double club foot, sometimes (3 : 60) ascites; finally, hydrocephalus has been associated with large quantities of liquor amnii (3 : 60) (*Truzzi, Ortega Pilat*). It is also found combined with anasarca and ascites in congenital rickets (see Figs. 84 and 85). The two adjoining figures of such a fœtus and its skeleton clearly show the stunted extremities, two congenital incisors in the upper jaw, the form of the pelvis compressed on all sides (pseudo-osteo-malacic) and the bent bones of the forearm, the thighs and the legs. Most of these anomalies owe their origin to the same causes from which the hydrocephalus arises. In addition, other defects exist, such as diaphragmatic hernia, the absence of a kidney, etc. These facts explain why so many hydrocephalic children die during the course of pregnancy, and are born in a more or less dropsical or macerated condition, the disease commencing in the earliest period of their development. This was found to be the case ten times in 60 cases (Fig. 86). In regard to the behavior of the hydrocephalic children in the uterus, we find this interesting fact, viz.: they are born in abnormal presentations, especially in *breech presentations*, much oftener than healthy and normally developed children are. There were found by

FIG. 86.



Hydrocephalus of a three-months-old fœtus with anasarca, ascites and marked torsion of the umbilical cord. Policlinic, 1884.

Hohl,	among	77	cases,	62	head	presentations,	15	breech	presentations.
The author,	"	60	"	33	"	"	27	"	"
Keith,	"	69	"	59	"	"	9	"	"
Schuchard,	"	73	"	52	"	"	21	"	"

And one oblique presentation.

Chassinat remarks that satisfactory observations of the frequency of occurrence of oblique presentations are wanting. Boehr mentions, among his seventeen cases, one with spina bifida which may have had a complete situs transversus. At any rate, it is an established fact that *breech presentations* occur at least five or six times more frequently with hydrocephalic children than usual. The reason for this lies in the circumstance that the child's enlarged head has not as much room in the lower uterine segment as in the upper, and that it may, therefore, more readily slip to one side, even if the head lies above the os uteri, and is thus finally brought into the fundus by the contraction of the uterus. B. Schultze has reported a case in which this change in position probably took place rather rapidly. He thinks that it may have been assisted by the strong reflex movements of the fœtus which appeared with the beginning of the pains, and that the uterus may have brought about this change in the position, because, in consequence of the head presenting, it experienced an extreme degree of pressure against the pelvic walls. In general, however, this movement of the fœtus does not take place suddenly, but more gradually.

The delivery has often terminated rather quickly and easily in the milder forms of this affection; even well-marked cases of hydrocephalus have been born spontaneously. The dangers which beset the mother do not merely depend upon the quantity of serum found in the skull, but mainly upon the condition of the cranial bones, their sutures and fontanelles, also upon the child's position and presentation, upon the activity of the uterus, whether the fœtus lives and the membranes are tense and thick, or whether it is macerated and the head and its bones are loose and pliable, and, finally, upon the condition of the maternal pelvis.

The course of labor with hydrocephalic children who present in vertex positions depends in part upon the manner of engagement of the head. Hohl already stated that the incarceration in the small pelvis may occur sooner when the parietal bone lying in front has descended lower down and become engaged, since in this case the skull need not pass the conjugata vera with its greatest transverse diameter, but may enter the pelvis with a smaller one, such as one drawn from one lateral fontanelle to the sagittal suture. Boehr rightly added that a brow position or one with the sinciput low down and in front may likewise render the incarceration of the hydrocephalus more easily possible than if the head is placed with the horizontal surface of its cranial roof flat above the introitus. The greatest difficulty in the whole act of delivery with hydrocephalus lies in the inability of the head to enter the bony pelvic canal; with every pain it becomes like a tense bladder inflated by pressure from above. Or it is firmly pushed against the pelvic inlet and does not descend any further. If, on the other hand, a segment of the skull is incarcerated in the inlet of the pelvis, and its bones are not too hard, vigorous pains may still mould it to the small pelvis, and a spontaneous expulsion may then occur. This happened in 35 out of 173 cases, or more than 25 per cent. The delivery of hydrocephalic children is, however, usually associated with anomalous pains because of the pressure upon the lower uterine segment, with extensive swelling of the cervical lips, and, as a consequence of this, with slow dilatation of the os and a dry and inelastic condition of the cervix. If the head tapers off and is incarcerated in the small pelvis, the cervix will, owing to this œdema, be much more likely to be lacerated, since an unusually large circumference of the head must pass through it. The violent, very painful, and, for a long time, very ineffectual uterine contractions, together with the swelling of the soft parts, may give rise to a febrile condition during labor, and the rigidity of the cervix may necessitate incisions (see my observations, cited above). Exceptionally an unusually large hydrocephalus may be expelled without artificial aid if—as Stolz observed—spontaneous rupture of the sac takes place during its passage through the small pelvis.

A natural expulsion of the child is to be expected sooner if the breech presents, because here the smaller end of the skull, the chin and the base of the skull may engage more easily. The cranial bones are then compressed laterally, the skull becomes oblong in shape and it is more readily moulded to the pelvis, hence after-coming dropsical heads, even of rather a large circumference, sometimes offer no more difficulties than non-hydrocephalic ones. This is proved by the cases of Busch, Hecker (2 and 3), Schultze and Arneth, in which a simple, easy manual extraction of the child sufficed. The mother, however, is always exposed to more or less danger, even when the expulsion of the child is natural.

Artificial assistance during delivery is necessary in the large majority of these cases. Even the milder forms of this affection, the cranial bones are hard and unyielding, may present such serious obstacles that one operation after another is performed, until, finally, the obstetrician has exhausted all his strength and still has failed. Thus, among the above-mentioned sixty cases, two women died undelivered (*Fischer*, *Hecker*) of rupture of the uterus, which arose partly from the long contusion of this organ, partly from the unavoidable lesions connected with the difficult extractions. The same thing may occur before any artificial assistance has been rendered, and did occur five times in Hohl's 77 cases. Veit observed rupture of the uterus four times in nine cases of hydrocephalus. In his opinion, it is nowhere as frequent as in this anomaly, mainly for the reason that hydrocephalus is generally not only associated with an excessive quantity of liquor amnii, but often also with an œdematous infiltration of the lower uterine segment, the cervix being very long drawn out. Among the 73 cases collated by Schuchard, rupture of the uterus occurred fourteen times (= 19 per cent.), every time with head presentation, eight times spontaneously, and six times after forcible attempts at extraction with the forceps. Of my eight patients not one was lost.

Unfortunately the *diagnosis* is not made in a large number of cases. It is, in fact, exceedingly difficult in the milder forms of the disease. The sutures in such heads are not too broad, the bones not soft, the fontanelles not unusually large, and the face is not disproportionately smaller than the skull, so that even an examination with one-half of the hand may not make it clear; we simply recognize that we have to deal with a large child's head. This occurred to me in the two cases before published. On the other hand, we may be misled, by a certain breadth of the sutures and fontanelles, into the diagnosis of a hydrocephalus, when it does not exist. Moreover, it has occurred that the portion of the hydrocephalus incarcerated in the small pelvis has been confounded with a fœtal sac (*L. von Holst*). In a case of uterine carcinoma, in which the parturient quickly succumbed to an air embolus, the fœtus being dead, Prof. Bollinger and I mistook at the first glance a sac projecting nearly into the vulva for the membranes, whereas it was merely formed by the hydrocephalus. Merriman reports (comp. *Hohl*) that an over-distended urinary bladder was mistaken for a hydrocephalus and punctured by a surgeon.

The additional circumstances which may render the diagnosis of hydrocephalus more probable are the existence of other deformities of the fœtus; for instance, spina bifida, pes varus, cleft abdominal walls, curvatures of the extremities, and also the proofs of a hydramnios; all of these are but rarely recognized, the first of them only during labor with a breech presentation. The child having been born in a breech presentation as far as the head, and extraction of the latter being extremely difficult, we should first ascertain the locality of the face, and then examine to find out if the conjugate is narrowed. If the pelvis is not found to be narrow enough to account for the difficulty in delivery, the fundus uteri should be grasped, in order to determine the amount of its expansion and the contours of the head. Its size will sometimes reveal the true condition of affairs, at least with great probability. If this examination should prove of no avail, nothing remains but to introduce the whole hand and to map out the contours of the head. In this way a large hydrocephalus will be distinctly recognized, by the considerable disproportion between the large, globular skull and the small, triangular face; by the prominence of the frontal bones and parietal tuberosities, and by the gaping sutures and fontanelles. The fact that a hydrocephalus is still more rarely diagnosed when the head comes last than when it presents, only proves that the above-stated method of examination is not usually applied in practice. Even when the hydrocephalic head presents, the diagnosis in most cases can only be established with certainty by an examination with the whole hand in the manner given above.

Prognosis.—The termination of the labor for mother and child is at least to be designated as serious for both. Among the 77 cases collated by Hohl, 21 mothers died = 17 per cent.; of Schuchard's 73 cases, 13 mothers died = 19.2 per cent. The prognosis for the mothers appears to have been improved recently by superior antisepsis. Of Hohl's cases only 14, of mine, 27, altogether 41 out of 137 cases = 33 per cent., were terminated by the natural powers. Artificial assistance, therefore, was required in 66 per cent. of the deliveries of hydrocephalic children. According to Chassinat, 18 cases out of 28 = 64 per cent. required assistance. The causes of death are: rupture of the uterus, peritonitis, septic processes—presumably in consequence of gangrene from pressure—and hemorrhages. Those who survive are often affected with serious sequels, among which may be mentioned: paralyses and spasms of the lower extremities, extensive perineal and vaginal lacerations, and, as a consequence, prolapse of the vagina and uterus. Concerning the prognosis for the hydrocephalic children which are born alive, the prospects for preserving life (according to Chassinat's investigations covering 125 cases) are very poor; almost all die soon after delivery, and those who live longer hardly lead a human existence. Of 60 children born with hydrocephalus (according to Chassinat), 41 were stillborn and only 19 born alive (seven spontaneous deliveries); of the latter, fifteen died before reaching the age of 21 years, four were still alive, one was cured; but in all these cases the hydrocephalus was not specially pronounced sub partu. Among my 60 cases, 17 children were born alive, but seven of them died within a few hours after delivery; only nine or ten remained alive for any length of time. The mortality would therefore be about 83 per cent., if the fœtuses (20 per cent.), which were dead or macerated before their delivery, were not deducted. Since these statements prove that the fœtus is lost in the majority of the cases and that it rarely remains alive, even if born living, we are justified in giving them the second place in our attentions, and regarding first of all the life and health of the mother, being careful at the same time not to attempt any dangerous and doubtful operation.

Treatment.—I find that among 60 cases of hydrocephalus reported in recent literature, the forceps were applied in 18 cases to the presenting head, and puncture or perforation was employed in only 17. Some persons may therefore be led into the erroneous opinion that the forceps were indicated oftener than perforation, and were oftener successful; but this is not true, because it was reported that in eleven of these cases the forceps had slipped, or were unsuccessfully applied, or were successful in delivering the head only after great exertions. F. Weber still strongly recommends the application of the forceps for the purpose of compressing the skull and, if possible, of rupturing the hydrocephalic sac; but Schwarz has justly pointed out that, in Germany, we regard such a procedure as a mistake. The forceps are not adapted to the hydrocephalus, because their cephalic curve is too small and the blades more dangerous than extraction with Mesnard's bone-forceps and the cranioclast. I should advise not to try the hook too long, but, if the head does not follow, rather to take away the skull, piece by piece, with Chiari's bone-forceps, leaving the soft parts behind, in order to draw down the trunk with them.

2. Hydromeningocele, Hydrencephalocele, Intrafœtatio Capitis.

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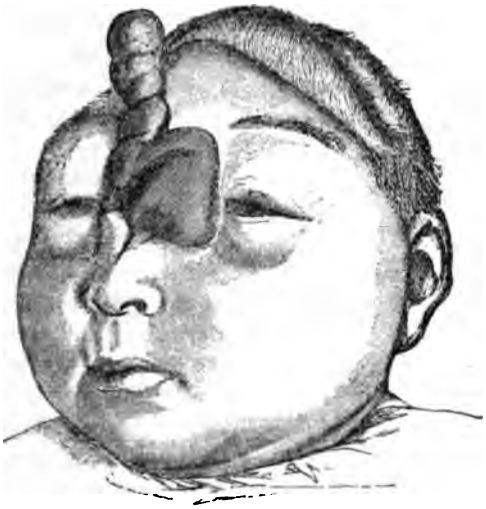
Hydromeningocele is a peculiar kind of hydrocephalus externus, in which a sac of the arachnoid filled with serum prolapses through a gap in the skull and forms a tumor on the cranium, which may cause some obstruction to delivery.

I know of only one case of this kind in literature, that of H. B. Ayres; in this patient, a Vpara, 32 years of age, an enormous head presented, on which, after the rupture of the membranes, a second sac appeared, which entered the pelvis but again receded. It was so constituted that it might have been mistaken for the membranes of a second child. Ayres punctured it, drew off a large quantity of serum and a spontaneous expulsion of the child followed. On the spina occipitalis externa it had a sac from which the serum had been discharged. The fluid, however, gradually accumulated again post-partum, and the child died on the 20th day. The round aperture in the occiput was 1¼ inches wide and 1¾ inches long; the sac contained the dura and pia mater and also a conical piece of the brain. A *hydromeningocele*, 9 inches high, 2½ inches wide, and 1½ inches long, at the root of the nose, was observed by Valenta and Wallmann in a new-born child, but it had not obstructed delivery.

Hydrencephalocele, the other form of hydrocephalus, occurs more frequently than hydromeningocele, but is still rare. It is the result of a large accumulation of water in the ventricles; the cranium has been cleft at some point and the meninges, brain and serum have formed a sac on the skull, which ranges in size from a hazelnut to a child's head. According to the location on the skull, we distinguish: I. A *hydrencephalocele anterior*, where the fissure occurs above the nasal bones. The accompanying microcephalus with encephalocele anterior was born in a brow-face presentation, in such a manner that the tumor together with the adjoining mass projected right into the os uteri. It was born alive on May 27th, 1887, in the Policlinic at Munich, and died on June 2d. It was found to be an encephalocele anterior and the defects were discovered in the frontal and parietal bones (see Fig. 87). II. In *hydrencephalocele posterior*, the opening in the skull is constantly found higher or lower in the median line of the ridge of the occipital bone. III. In *hydrencephalocele lateralis* the sac is located in the region of one of the lateral fontanelles. IV. In *hydrencephalocele superior* it is over t middle of the skull. V. In *hydrencephalocele inferior*, the hernial s penetrates the cavities of the sphenoid bone or enters the pharyngeal buccal cavities. It is evident that only the largest of such tumors a capable of producing any actual disturbances of delivery. The tumor m cause a faulty presentation and position of the child, and may be mistake for the sac of a second fœtus or a tumor of the uterus or the pelvis, for is often connected with the skull by a small pedicle and is very movabl The tumor may even be double (comp. Förster, "Missbild.," Plate x Fig. 10). The following are the few cases, in addition to that of Ayre

FIG. 87.



Microcephalus. Encephalocele anterior. Defects in the frontal and both parietal bones. Brow-face presentation.

narrated above, in which such disturbances of delivery were actually observed:—

1. A case of Häberlein (*Zeitsch. f. Wundärzte und Geburtsh.*, XVII, 3, S. 168), in which a Vpara, 30 years old, had been in labor 15 hours, with a second *face presentation*. The pelvis was normal, but the delivery did not advance; after three hours (ergot) the face descended and a living child was extracted by the aid of the forceps; on its occiput was a tumor double the size of the head, with a pedicle 1½ inches broad. The head was small, the forehead low, the face large. 1½ pints of fluid were removed by aspiration on the sixth day; the child died four hours afterward and the diagnosis of hydrencephalocele posterior was verified.

The *face presentation* and the delay in the delivery were in this case evidently caused by the tumor, and it was fortunate that the forceps succeeded and that the tumor, undiminished in size, could pass the pelvis of the mother.

2. Beneke (*Archiv. f. Wissensch. Heilkunde*, II, p. 169, 1864). In this case the *right ear* is said to have been presenting, and the obstetrician then to have performed version and, in introducing his hand, to have pressed down the sac attached to the head. This sac had, immediately after delivery, a circumference of 17 inches, was 7 inches long, 5½ inches high; the child was alive; the sac grew to 21 inches and became gangrenous and the child died at the age of eleven weeks. The large hemispheres were found partly in the sac.

It is worthy of note that the same mother is said to have given birth, two years before, to a child with *hydrencephalocele; the sac burst in the uterus and the brain was exposed.*

In this case, too, the faulty presentation was caused by the tumor; even after version an internal expression of the head became necessary.

If the tumor is very large, the child's head will not have room enough above the internal os; it will therefore more easily deviate to one side and develop into a *breech presentation.* This occurred in a case observed by Breslau, in which a hydrencephalocele presented, which closely resembled a hydrencephalocele inferior s. sphenoidalis.

Intrafœtatio capitis may likewise cause some disturbance of labor, as is shown in the following case:—

A second footling presentation, prolapse of the umbilical cord and hydramnios were found in a IIpara, 28 years of age. The necessary extraction of the child was very difficult; the muscles of the thorax were torn and the vertebral column broken. The head was double its natural size and from the mouth hung a pedunculated tumor the size of a man's fist, with cysts, in which Rindfleisch found portions of a second fœtus. The fœtus was a female, weighed 1548 gm. and was about 23–24 weeks old (*Virchow's Arch.*, XXX, 406).

All of the above-mentioned cases were only diagnosticated by the introduction of the half or the entire hand. Whenever these tumors constitute any obstacle to delivery—not to be overcome by moderate traction with the forceps upon the presenting head, or, in breech presentations, on the child's body—it is best to reduce their size by puncture with a curved trocar. If the head does not then follow, we must perform version with subsequent extraction. In case of large pedunculated tumors we may—since, in any event, the child is lost—consider the propriety of removing the tumor by means of scissors or a sickle-shaped knife.

(B) Two kinds of new growths on the neck may produce disturbances of labor, viz.: the so-called cystic hygroma and *struma congenita* (bronchocele). Both occur congenitally and assume rather large proportions.

1. Cystic Hygroma.

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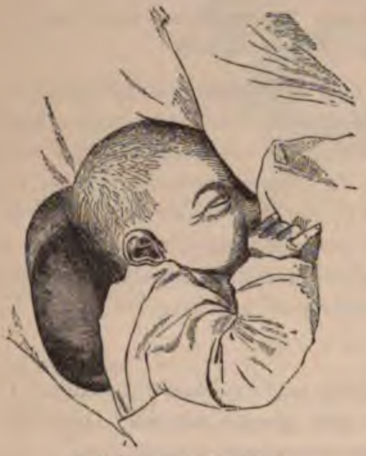
1. *Cystic hygromata* of the neck are located either in front or on the nape of the neck and sometimes descend as far as the thorax. They may also spring from the pectoralis muscle and may attain the size of a child's head. My assistant, Dr. Vonwiller, has described such a case, and also collated from literature similar cases of cystic hygromata and simple cysts of the neck.

FIG. 88.

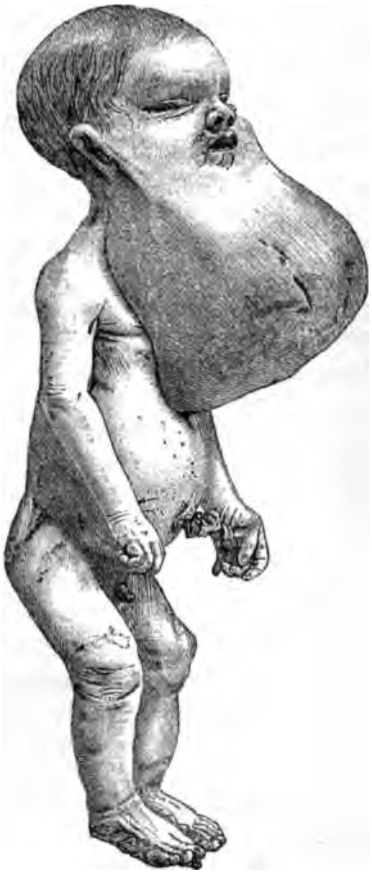


Cystic Hygroma of the Neck.

Cystic hygromata have their origin in cystoid degenerated lymphatic vessels; they are usually multilocular, or, if unilocular, traces of former septa are present. They extend deep into the connective tissue and even into the cervical organs, are mostly situated in the submaxillary region and lined with endothelium.

Simple cysts of the neck have their place of predilection between the mastoid processes and the hyoid bone, at the inner margin of the sterno-cleido mastoid muscle, and also in the supraclavicular fossa; they may likewise reach a considerable size. They are rather superficial, and their wall consists of connective tissue, on the inner surface of which epithelium is found (case illustrated by Vonwiller). Their contents are clear, serous, viscid or mixed with blood; they arise from the lymph ducts which are obliterated at both ends and have undergone cystic enlargement in the middle (*Roser*). I refer to Fig. 88, illustrating a case of congenital cystic hygroma which furnished a considerable obstacle to delivery, although the child (almost fully developed) was not very large. Here there are—just as in the seven cases of Otto—two large symmetrical sacs on the neck, separated by a groove formed by the ligamentum nuchæ; they reach from the linea semicircularis of the occiput as far as the upper border of the scapula and, on both sides, as far as the sterno-cleido-mastoid. Schücking, after performing perforation on a child's head in a brow presentation, was compelled to incise with a pair of scissors a tumor situated on the left side of the neck, which tumor, after discharging a great deal of blood, still weighed 650 gm. (the child's weight being 3500 gm.) and extended from the hyoid bone down to the manubrium sterni. He designated the tumor as "a cervical cyst with a cavernous structure." Simple cysts also occur on the neck, as well as on the thorax and other parts of the body. In the case of Ed. Martin, for instance, the extraction of the trunk after the delivery of the head became necessary, and the multiple cystic formations in the jugular and axillary regions, together with the absence of the lymphatic glands in these regions, seemed to point to the origin of the cysts as being in the lymphatic system. A. Martin observed a similar case. A case of J. F. Clarke has recently been reported, in which cystic hygroma probably existed, but it was not mentioned whether it caused any hindrance to delivery.

FIG. 89.



Struma enchondromatodes congenita. Footling presentation. Spontaneous delivery.

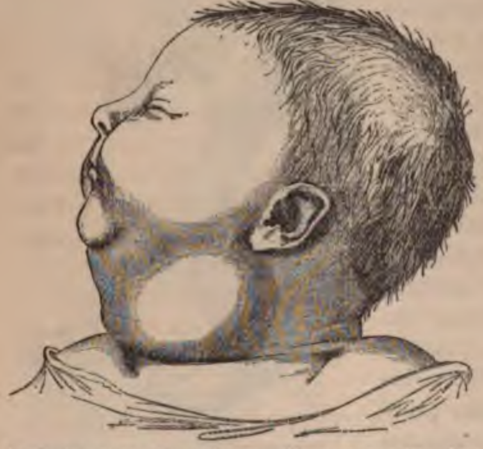
2. A case of congenital struma cystica (goitre) has been described by Hubbauer, which complicated the course of labor by its great size. It occurred in a XIIpara, who was always delivered very easily before, but whose last delivery was very difficult. On the left side of the neck of the otherwise well-formed boy, a soft tumor was found, fluctuating in places. It commenced at the right side of the chin, had its origin in the left lobe of the thyroid, contained a large quantity of serum and was 1½ times as large as the child's head.

The congenital strumata (goitres) are most frequently hyperplastic, that is, they show a uniform increase of all the elements of the glands; very vascular follicular strumata are also quite frequent, but the cystic variety does not occur so often. Demme observed a pure fibrous struma, as large as a plum, in a fœtus from four to five months old. The case described by Vonwiller (see Fig. 89) is unique. It is an enchondroma, twice the size of a child's head, which, evidently in the earliest period of fœtal development, caused the disappearance of the thyroid vesicles by the proliferation of a remnant of one of the lower mandibular arches into the thyroid gland.

The child, an almost fully developed boy, was born spontaneously in a breech presentation, but died before the arrival of the physician, after the head together with the tumor had been compressed in the small pelvis for one and a half hours.

Other cases of true congenital goitre have been reported as causes of face presentations by Ahlfeld, Löhlein and Hecker, as was mentioned above. The accompanying illustration (Fig. 90) of a congenital goitre with a dolichocephalic skull, where the child did not present by the face, is taken from a recently born child. Those interested in this subject will find a detailed statement of the case in Vonwiller's report. Most children with congenital goitres are born spontaneously, but many of them die soon after delivery from atelectasis of the lungs, or bronchopneumonia, or œdema pulmonum and œdema cerebri in consequence of pressure upon the trachea and the vagus (cases of Hecker, Spiegelberg and others). All tumors of this kind are rarely diagnosticated sub partu with regard to their points of origin. Their existence will only be recognized by the introduction of several fingers, and sometimes not until after the birth of the head or the entire body. If the rest of the body should not follow on moderate traction, the tumor causing the delay should be punctured with a curved trocar and its contents removed. We must proceed very cautiously and not make too deep a puncture, since such children, though in great peril, may still be brought forth alive and even completely cured (comp. case of J. Roux). It will

FIG. 90.



Congenital goitre. Circumference of the neck, 24.5 cm. Boy, 51 cm. 3790 gm.

very rarely be necessary to diminish the size of the tumor by incision or to remove it.

(C) Disturbances of labor due to a faulty condition of the thorax.

1. An unusual breadth of the shoulders and chest of the fœtus. This occurs not only with strongly-developed fœtuses, but also with a small and deformed skull, even with an anencephalus, and also with an average-sized head. The obstacle to delivery caused by this condition may manifest itself in the failure of the head to advance, inasmuch as the thorax is unable to enter the pelvic canal; or it may first appear after the birth of the head, in that the shoulders stick fast in the pelvis—which circumstance, especially if the umbilical cord is coiled around the neck, places the child's life in extreme jeopardy.

Jacquemier, who has studied this kind of dystocia more in detail, states that of 26 children only six were born alive. This fatal result is partly explained by the premature detachment of the placenta, occasioned by the strong and fruitless efforts of the uterus. This, together with the constriction and compression of the neck and chest, causes the death of the child from suffocation. Such a dystocia is also dangerous for the mother. According to Jacquemier, six of the 26 died in consequence of the protracted labor and the attempted manipulations; three died undelivered. The great contusion of the maternal soft parts, the enormous distention of the uterus, and its powerful, fruitless contractions, certainly contribute no less to this disastrous termination than do the frequent vain attempts of the physician to extract the child undiminished in size. Schilling's statements go to prove that, when the body is large, the shoulders constitute an impediment only in exceptional cases. Among 158 excessively large children, born at the Leipsic Clinic, out of 2899 deliveries, he does not once mention having been obliged to employ any unusually forcible extraction for the shoulders, although he explicitly mentions that the breadth of the shoulders may cause a delay in the delivery, and he has specially noted a breadth of shoulders of 14.0 cm. in a case in which the delivery terminated spontaneously.

A well-developed chest may cause some trouble in the delivery both after extractions by the pelvis and after version. Adelmann (see Schilling) relates a case in which the size of the thorax and the breadth of the shoulders after version caused great difficulty in the descent of the fœtus through the normally large pelvis of a IIIpara. The chest was so badly compressed at the pelvic inlet that it appeared to be divided in half, while the sternum had been strongly pressed in toward the vertebral column.

Two of the most interesting cases in recent times are, first, the one of A. Martin, who extracted a perforated child which still weighed 7470 gm. without brain or blood and showed a breadth across the shoulders of 16 cm., a circumference of shoulders of 47 cm. and a breadth across the trochanters of 15 cm.; second, the case of Häckermann (Hamburg), in which the girl weighed 6.5 kgm. and was 65 cm. long, and the breadth across the shoulders was 19.5 cm.

The head was delivered by the forceps while she was still alive; the subsequent extraction of the trunk did not succeed and the child died, the ligamentous connection of the cervical vertebræ having been injured; the left arm in front was finally brought down and the trunk extracted with it.

The *diagnosis* of an impediment to delivery due to an excessively large thorax can usually only be made after the birth of the head or breech, since the parts already delivered permit us to come to a definite conclusion as to the size of those still within the genitals. An examination with four fingers will show us that the thorax either completely fills the small pelvis or still stands high above it. Jacquemier asserts that we can safely conclude that the shoulders are too broad if the head, after its escape out of the vulva, does not rotate with the face to the side, but remains turned backward or upward. The incarceration of the shoulders in the transverse diameter likewise prevents the face from rotating laterally, and frequently occurs even with a normal circumference of the thorax. The delivery may likewise become complicated, as already mentioned, by an abnormal breadth of the shoulders of a hemi- or an anencephalus. Hohl states that among 40 cases of this kind the labor had to be terminated by forceps four times, owing to excessively broad shoulders.

The *prognosis* is the more unfavorable, the longer the incarceration of the fœtus has lasted and the greater the number of attempted operations which have been tried. It is more unfavorable in breech than in head presentations, and also with the cord coiled around the neck. Sometimes the heads of large children are born rather easily and quickly and the midwife attempts for some length of time to extract the child, so that medical aid is sought at a very late stage. The prognosis thus becomes worse; 33 per cent. of the mothers and 66 per cent. of the children have succumbed.

An accumulation of water in the pleural cavities of the child, hydrothorax, may also greatly complicate delivery by reason of the great enlargement of the child's chest. Hohl ("Geburten Kranker Kinder," p. 283), cites the cases of Severienne, Carus, Gottel, Siebold, Harick and his own. Excepting these, I know of but one other case, that of Bührlen (*Schmidt's J.*, Bd. 94, 198). This disease of the child appears to be a much rarer cause of dystocia than the analogous diseases of the abdomen. During the delivery we shall only be able to diagnosticate the abnormal circumference of the thorax, but not the hydrothorax, unless the abdomen has already been opened and fluctuation can be felt through the diaphragm. It is an interesting fact that, in Hohl's case, an oblique presentation of the child existed, and that the introduction of the hand so as to reach the feet was very difficult and tiresome.

Anasarca, ascites and other diseases are often associated with the hydrothorax; hydramnios (*Bührlen*) and anasarca of the parturient have also occurred with this disease of the child. The prognosis for the diseased child is bad ; it generally succumbs during delivery, or, if not, dies soon after.

Treatment.—If, in case of excessively large thorax, the child's head is born and the shoulders do not follow, their position should first be accurately ascertained ; then for the *extraction* of the shoulder the hand corresponding to the posterior shoulder should be selected. If the shoulder does not stand too high, the thumb, fore and middle fingers will suffice ; the pelvis of the parturient must not be too low. If the chest cannot be brought down by traction upon the shoulder, we should next endeavor to pass our fingers into the axilla which lies in front. After introducing the second hand, traction is to be made on both shoulders at the same time, the anterior being drawn more downward and forward.

If we do not succed by this means in extracting the thorax, its circumference should be reduced by drawing out one arm after the other. This manipulation is not exactly difficult, but is dangerous for the child, since the arm is liable to fracture. We first of all push the posterior arm from the back toward the side of the face by pressure on the humerus, then pass our fingers up as far as the elbow, and by pressure against it (the elbow) push the forearm over the breast and face,·until we can seize and gradually draw it out of the vagina without any force. The anterior arm is then to be loosened in the same manner, by depressing the child's head somewhat in the direction of the perineum, in order to get more room below the symphysis. When both arms are out of the vulva, traction must be made upon them and the head at the same time.

In some cases, in which both shoulders could not be pulled upon at the same time by both hands, because one of them stood too high, Smellie's blunt hook was pushed underneath the upper one and traction made upon both shoulders with the hook and the hand (*Hohl*). This instrument should be applied to the posterior shoulder, because the other is situated lower down and can be better grasped by the hand.

If the shoulders should not advance with this method of traction, we must first examine with half the hand to ascertain if the impediment may not be situated higher up, because a marked distention of the abdomen may likewise prevent the breast from escaping. The unusual size of the thorax will thereby be revealed and—the child in such difficult cases being usually already dead—opening of the child's chest for the purpose of removing its contents is indicated. If there is hydrothorax, the water will flow off and the extraction will offer no further difficulties. If, however, the thorax does not contain much fluid, the aperture should be enlarged, until we can introduce half the hand and remove the lungs and the heart.

The perforating trephine is more complicated and difficult to apply. The head and arms are not to be taken off, because they are needed for extracting the thorax. If these should be almost or completely torn off by the efforts at extraction, as sometimes occurs with ascites and over-distention of the fœtal bladder, after evisceration of the thorax the stump of the neck should be seized with Mesnard's cranial forceps and the child extracted by it.

If the head persistently remains high up, for instance, where it is prevented from escaping, version with subsequent extraction of the child is indicated. If, during the extraction, the broad thorax should not follow the narrow abdomen, a safe amount of traction being used, the abdomen must be opened, the diaphragm pierced with Smellie's scissors and the contents of the chest removed, as was done by Hohl.

(D) Disturbances of Labor due to a Faulty Condition of the Child's Abdomen.

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The dystocia caused by a faulty condition of the child's abdomen is much more frequent than that treated of in the previous chapter. First of all, the organs of the abdomen are much more numerous; many of these commence to secrete during fœtal life, so that an arrest of their secretion may readily cause a considerable distention of the abdomen. Then again the affections of the abdominal organs are often associated with ascites, which may attain a degree sufficient to constitute by itself a hindrance to delivery. The organs which most frequently cause an abnormal enlargement of the abdomen are the kidneys, then follows the bladder, together with the ureters, more rarely the liver, and still more infrequently the ovary.

1. The description of those tumors of the liver which have been causes

of delay in, or obstacles to the delivery, is somewhat defective. I know of only the following cases: (1) of Haase (*N. Z.*, XI, 262), (2) of Müller (*Hohl*, p. 286), (3) of Schlesinger (*Hohl*, p. 289), (4) of Nöggerath (*Deutsche Klinik*, 1854, No. 44; *Wochenschr.*, IV, 458). The first three cases resolve themselves into either hepatic physconia or a lymphatic tumor of the liver. In Nöggerath's case, a microscopic examination is said to have revealed a congenital carcinoma of the liver which weighed 2¼ pounds and was 8¾ inches wide, 6 inches high and 3 inches thick. The lymphatic tumor of the liver in Müller's case is said to have weighed 4 pounds. Although the centre of gravity must, presumably, have been shifted toward the breech, the head of the child presented in three of these cases, and only in Haase's case did the fœtus assume an oblique presentation, with the head lying to the left and with the left arm and cord prolapsed. The liver of this child—a girl, weighing 9 pounds, and 19½ inches in length—is said to have weighed one pound.

2. Webber reports a case in which a tumor of the spleen caused a disturbance of labor.

3. The delivery is much oftener disturbed by a fœtal enlargement of the kidney. Inflammatory processes in the fœtus cause a closure of the papillæ and the calyces, which produces a dilatation of the canaliculi and thus give to the kidney a cystoid appearance. One or both kidneys are thereby considerably enlarged—10–20 cm. long, 5–10 cm. wide and several cm. thick—the small cysts may be seen under the capsule and appear—as most of the authors have observed—like a compact mass of sago. In some cases, the cysts are much larger and the organ appears as though composed of nothing but cysts, varying in size from a pea to a walnut (see case reported by *Zervais*). Its weight may amount to several pounds; for instance, in a case of Andrae's it amounted to nearly 2250 gm. Ascitic fluid is frequently present with it, but exceptionally it is entirely wanting (cases of *Osiander*, *Mansa* and *Uhde*). It is interesting to note that, out of 17 of these cases, five children were born in breech presentation (reports of *Osiander*, *Uhde*, *Adamkiewicz*, *Zervais* and *Wolff*), that is nearly 30 per cent., or, in other words, breech presentations were met with ten times more frequently than with normally developed children. In ten of the remaining cases the delivery was obstructed only after the head had passed through the vulva in the usual manner, only two requiring the application of the forceps. Of the children in breech presentations only one was born spontaneously, the other four had to be extracted by a foot or the nates because the breech did not descend. Spontaneous delivery took place in my three cases, because they were all small children with moderate-sized tumors.

4. Breech presentation was also relatively frequent in those cases of disturbances of labor due to an enormous distention of the child's bladder. Altogether 17 such cases are known to me from literature, viz.: Windsor,

Vernhes, Truchsess (see *Hohl*), Depaul, Edw. Rose, Paul Portal, Cade, Duparcque, Delborier, Gaudon, Moreau, Freund, Jany, Hecker, Kristeller, Hartmann and Hirschberg. Three footling presentations are reported; two cases of breech presentations, though not expressly stated, are highly probable, judging from the descriptions. The over-distention of the urinary bladder is caused by an atresia, or by a complete absence of the urethra, and is often associated with other malformations, in that, for instance, the rectum may open into it by a small aperture. The bladder may become enormously distended; in Depaul's case it had, when inflated, a breadth of 21 cm., a height of 19 cm., and a thickness of 14 cm. In Comelli's case the circumference of the abdomen amounted to 48 cm. An hypertrophy of the bladder and a dilatation of one or both ureters often exist together with hydronephrosis, and in a case of Freund's a cystic kidney was found; the latter, however, is exceptional.

A greater or smaller amount of ascites is, as a rule, connected with the retention of urine. These diseases produce such an enormous distention of the abdomen of the fœtus, and thereby of the uterus itself, that the fundus uteri may reach the pit of the stomach as early as the seventh or eighth lunar month. The difference between the duration of the pregnancy and the enormous distention of the uterus may, therefore, be of importance for the diagnosis, especially since—as pointed out by Hecker—but little or no liquor amnii is found during the delivery. This over-distention of the uterus is also the cause of labor coming on usually as early as the seventh or eighth month. Hartmann had a case in which the bladder was 19 cm. long and the circumference of the abdomen only 31.5 cm.; the fœtus was 49½ cm. in length and weighed 3250 gm. This was the only instance in which the expulsion of the fœtus took place at the end of the ninth month. This malformation, which causes the retention of urine, is sometimes also connected with other diseases or arrested development in other parts of the body. Jany observed hydrocephalus and club-feet of the child; the latter were also observed by Kristeller. In conclusion, I would add that other co-existing anomalies of delivery are mentioned, such as prolapse of the cord in head presentation by Cade and Hecker, change of an oblique into a head presentation by Depaul, head presentation with both hands lying alongside by Hirschberg. Ebell and Windsor found the face presenting, and the umbilical cord prolapsed at the same time.

5. Ascites may likewise distend the child's abdomen to such a degree as to cause some difficulty in the delivery. Simple ascites, as a cause of dystocia, has been described in the cases of Dusterberg, Steinberger, F. Almeida and Herpin, and recently in two cases of K. Schröder and Voss. In the last-named case a kidney together with its ureter was wanting and the spleen was greatly enlarged. Footling presentation and hydramnios existed in Seulen's and Schröder's cases; three quarts of water are said to have escaped

from a rent in the abdominal wall of the child, and Seulen states that the liver weighed 750 gm. Wolczynsky found ascites and a bladder distended to the size of a child's head; the urethra, right kidney and ureter were wanting; there was also a left-sided hydronephrosis. The child's head was torn off in the attempts at extraction; the diaphragm was perforated and the trunk was then born spontaneously.

Olshausen's case is unique. The bladder, uterus and lower part of the large intestine were enormously distended, in consequence of an atresia urethræ et ani. They contained urine or urine and meconium and formed a very decided impediment to delivery after the birth of the head.

It is also worthy of remark, that some women have given birth several times in succession to children affected with ascites. Virchow had a case in which three children in succession suffered from this affection, and the last one—a seven months' old fœtus—exhibited traces of peritonitis. Syphilis is generally the cause of it.

6. Phänomenow's case is also *unique*. An enormous aortic aneurism, beginning immediately below the renal artery, necessitated the extraction of the child in a breech presentation. The circumference of the abdomen amounted to 40 cm.

Since the obstacle to delivery in these cases of excessive abdominal distention appears first after the birth of the head, its *diagnosis* will rarely be made beforehand. Even if the head is already born, or the pelvis, in a breech presentation, will not descend nor yield to traction, we can only ascertain that the over-distended abdomen constitutes the obstruction by the introduction of half the hand. In most cases it is impossible to ascertain whether it contains fluid or solid tumors; this, however, has but little significance, because the obstruction to delivery can only be removed by opening the abdomen. The enlarged organs, such as the spleen, kidneys, liver or bladder, have often been felt by the introduction of several fingers after puncturing the abdomen. When there is considerable ascites, it is sometimes possible, as in Hirschberg and Ebell's case, to plainly detect fluctuation by combined external and internal examination.

The *prognosis* for the mother is good with hepatic as well as with renal tumors and over-distention of the fœtal bladder, although the most difficult operations have often to be performed. The result, it is true, has not been stated in some cases, but none of the women whose puerperium has been reported suffered from any serious illness or died. This is partly explained by the fact that the greatest circumference of the abdomen is formed by soft parts, and therefore the maternal genitals do not suffer as great contusions as they do from an enlarged head and thorax. The prognosis for the child is so much the worse. All the four children with hepatic tumors died sub partu and had to be mutilated in order to extract them. Of the 17 affected with renal cysts, only three were born alive; these were extracted by

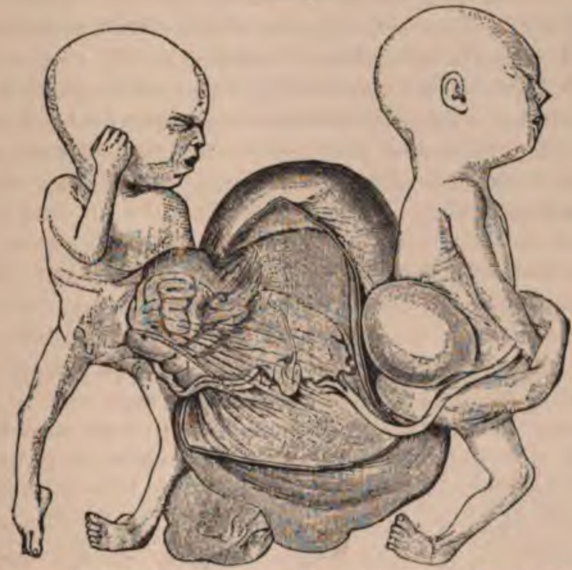
Pappenheim, Wolff and Uhde, but they died after a few hours, beca the enormous distention of the abdomen evidently prevented the pro establishment of respiration. Of 17 children suffering from over-distenti of the bladder none were born alive, although three (*Freund*, *Jany* a *Hartmann*) were extracted without diminishing the size of the abdomin cavity. The above diseases, which cause great enlargement of the child' abdomen, require, with very few exceptions, some assistance during labor. None of the four children with hepatic tumors, none of the 17 with renal cysts, and only one (*Hartmann's* case) of the 17 affected with over-distention of the bladder was born spontaneously.

Treatment.—If the breech or feet present, traction on them sometimes succeeds without opening the abdomen (cases of *Wolff*, *Zervais*, *Uhde*, *Pappenheim* and *Osiander*: cystic kidneys; and of *Freund* and *Jany*: over-distended bladder). In rare cases the abdomen may burst (*Rose's* case). How serious these obstacles generally are is evident from the fact, that among 26 cases of head presentations, the head, or the head and the arms, were in seven cases severed from the trunk by the attempts at extraction made by the midwife or the physician! The only mode of proceeding quickly and without any further injury to the child and the mother, is to puncture as soon as the enlargement of the child's abdomen has been recognized as an obstacle to delivery, or to perform evisceration. This is done, if the abdomen is easily accessible—as it is in breech presentations—by a trocar or Smellie's perforator; it is not necessary to narcotize the woman. In a vertex presentation after the birth of the head, if simple traction on the thorax is of no avail, the delivery can only be terminated by puncture or evisceration. If the abdomen stands high, so that the instrument can reach it only with great difficulty, the thorax should be perforated. Olshausen, after cutting off the already delivered head, turned the child, because the puncture of the abdomen had not caused a sufficient reduction of its size. The cases of Wolff, Voss and Mansa (cystic kidney) are instances of the necessity for such operations.

7. Lastly, the cases of intrafœtatio abdominalis belong to this chapter. A case of this kind has been reported by Schönfeld (*Schmidt's J.*, Bd. 38, 69): a sac with an embryo 16 cm. long in the abdomen. Another case has been described by Buhl (*Hecker* and *Buhl: Klin.* 1, 301). Owing to the great distention of the abdomen, this intrafœtatio abdominalis made it necessary to deliver the head with the forceps, and afterward to extract the trunk; the latter was accomplished with great difficulty and without opening the abdomen. Buhl, after he had emptied the tumor of its fluid contents by puncture, found the upper and lower extremities, the stump of the head, the ribs and abdomen with the intestines in it; it was attached to the diaphragm.

In connection with this subject mention should be made of ***hernia umbilicalis congenita***, or fœtal eventration. The hernial contents generally consist of the intestines and the liver, sometimes also of the stomach and spleen, and its coverings are formed by the amnion, at times by the tendinous fibres of the abdominal fasciæ, and on the inner surface by the peritoneum. The size of these tumors varies greatly; sacs as large as a fœtal head, with broader or narrower bases, appear to be attached to the abdomen. The vessels of the umbilical cord course through the wall of the sac; in large tumors the funis becomes attached mostly to their lower half, and more frequently on the left side than on the right. In most of the cases no accurate description of the course of labor with such fœtuses has been given. There are, however, three accurately reported cases; one of Spessa's (*Schmidt's J.*, Bd. 23, 211) and two of Balfour's (*Mtschr.*, XVIII, 87). These are interesting, owing to the fact that one child presented in a vertex position, the second in a footling, and the third in an oblique position (comp. Starke's *Archiv*, I, 44). In Spessa's case both hands presented, together with a large, globular, fleshy mass, the hernia being above. The child was turned and extracted, and exhibited on its back a large tumor extending from the neck as far as the anus, and containing five pounds of fluid (hydrorrhachis). Doléris found five cases out of six of this kind with the shoulder presenting. The tumor is said to descend first, then to burst during the first uterine contractions, after which an oblique presentation is said to arise; the fœtus then is bent double over its back, and is born as in spontaneous evolution.

FIG. 91.



Twins. Hernia umbilicalis of one of them. Four club-feet. Spina bifida. Atresia genit. Weight of both fœtuses, together with the placenta, 1820 gm. One-third natural size.

I may also mention a case of Stanley's, not because it was a remarkable instance of dystocia, but because the midwife tied and cut off the umbilical hernia, together with the intestine, from which a fæcal fistula arose on the fourth day, and the child died three days later. A number of smaller herniæ of the umbilical cord have been healed after delivery, among others Margariteau's (comp. *Schmidt's J.*, Bd. 88, 333).

In 1844 Dr. Pies described a remarkable case, in which a large common umbilical hernia in twins presented; he turned and extracted by the four feet; the sac and the one short umbilical cord were torn during the delivery. A case, occurring in Munich in June, 1887, is not less interesting, *twins* (Fig. 91) being born after a delivery lasting four days, both being in vertex position with complete atresia of the genitals. They had but one amnion, and one of them had a hernia of the umbilical cord with ectopia viscerum and a very large-sized umbilical vesicle. The other twin had a cyst in the ischiatic region, spina bifida. The amniotic sac was not torn during the delivery. Both children were boys, the testicles being found in the renal region; there were about 400 gm. of fluid between the amnion and placenta in the fœtus with the umbilical hernia. All of the four lower extremities had club feet.

(E) Tumors of the posterior sacral region as obstacles to delivery.

LITERATURE.

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The tumors which occur in the posterior sacral region of the child and which by their size may prevent its expulsion are:—

1. *Hernia dorsalis congenita*. It is a hernia of the ischiatic notch containing either a portion of the intestines (*Bezold's* case) or some other viscera, as for instance, the bladder (case of *Schreger*), and appears isolated or in connection with other new formations, such as simple or compound cysts (comp. *Lotzbeck*, p. 4–5). Of the six observed cases of this kind four were

boys and two girls; the fœtuses were generally well developed; some, however, were affected with pes equinus, hydrocephalus or imperforate anus.

2. Hydrorrhachis sacralis congenita occurs mostly along with spina bifida. The former is an accumulation of fluid in a sac, which is formed from the spinal membranes and prolapsed under the skin, and which becomes prominent in the ischiatic or coccygeal region if the vertebral canal is closed; its point of exit is either between two vertebræ or at the termination of the sacral canal (comp. Fig. 91). In hydrorrhachis sacralis cum spina bifida (spina bifida sacralis) the posterior wall of the os sacrum is partially or wholly open. A further distinction is also made between spina bifida lumbalis, lumbo-sacralis and sacralis (superior, inferior, media, totalis). This disease seems to occur somewhat oftener in girls than in boys; it is frequently associated with other affections, such as hydrocephalus and club-feet (Fig. 91). The tumors vary in size from that of a hen's egg to enormous proportion; they have been found sub partu the size of a man's fist and of an orange. The surface is smooth or uneven, with cysts and fungous proliferations; they may also contain, besides the fluid, parts of the spinal cord and nerve trunks.

3. Fibrous tumors, which may be solid or cavernous. The solid—that is, the simple fibromata—are very rare, mostly small. They may, however, grow in extra-uterine life and attain a considerable size (comp. *Lotzbeck's* case, in which the tumor had a circumference of 29 cm.). The cavernous so-called cystic tumors (tumores sacro-coccygei, hygromata cystica) are much more frequent. They usually spring from the os sacrum, less frequently from the coccyx alone, but more frequently from both bones, exceptionally from the ischiatic notch, and they may even arise from the coccygeal spines. The connection of the tumor with these parts is either sessile or loosely movable, in the shape of a cord or pedicle of connective tissue, at times covered over with calcareous deposits. They are shaped like a pear, a flask, a cone, or a globe. Their size varies from that of a fist to that of a man's head. At times they grow very rapidly (case of *Himly*, in six months from the size of an apple to that of a head). They may be separated into simple cysts, where one cyst is prominently developed, is multilocular, or contains trabecular proliferations on the inner surface (cases of *Buxtorf*, *Gläser*, *Schindler*), or there are several groups of cysts (*Schwarz*, *Gläser*), or there are partly isolated, partly communicating cysts. Next to the simple cysts come the mixed cystic tumors, in which are to be distinguished single cysts or groups of cysts imbedded in a stroma abounding in connective tissue and fat. On account of their soft, mostly spongy character, they have also been called sarcoma, cysto-sarcoma sacrale (cases of *Kropf*, *Gilles*, *Mauthner*: osteosarcoma). Lotzbeck, finally, separates these from the compound cystic tumors, which contain, in addition to the connective tissue, other tissue elements, such as cartilage and parts of bone. Raffa calls them teratomata, and in a tumor with a circumference of 43 cm., he found an

encephaloid medullary substance, cysts ranging from the size of a pea up that of a hen's egg, mucous tissue, fibrous connective tissue, osteoid and r bone tissue, particles of fat and the débris of epithelia. Beumer four a sarcoma-like tissue with small portions of hyaline cartilages. The ca represented in Figs. 36 and 37 was a pure round-cell sarcoma.

4. Besides vascular tumors (which rarely attain any considerable size that region) mention must also be made of congenital carcinoma of the po terior sacral wall. The only case, to my knowledge, in which a congenit cystocarcinoma of considerable size has been found and proven by means microscopical examination, is the one of Lotzbeck (to be found in Luschka collection), in which the tumor, in a perfectly developed female chil covered the entire region of the os sacrum, was larger than a child's hea and reached, bottle-shaped, as far as the middle of the thighs. It is n known whether this tumor caused any disturbance of labor.

5. Closely related to the cystic hygromata previously described are als hyperplasias of the coccygeal gland, which exhibit a glandular, vesicula structure and also cellular elements, such as are found in that gland. Vircho found in a tumor of this kind, the size of a fist, bundles of striated muscula fibres. Prior to this, Krause, Jr., had found smooth fibres in similar cases He also demonstrated the existence of single, soft and coherent masses similar to the granular stratum of the retina, and, in other places, of solid fibrous masses being transformed into cartilage and covered with perichondrium. With the exception of these conditions, all of the others suggested that the origin of the tumors was wholly from the coccygeal gland.

6. In this same category belong the tumors of the sacral region which are to be designated as intrafœtationes sacrales; these tumors contain not only muscles, tendons, bones or cartilage, but also composite vascular and structural groups of a human organism. They inclose either extremities or parts of them, a head or parts of it or the intestines. They sometimes attain a very considerable size. Cases of this kind have been collated by Geller and subsequently by Lotzbeck. Many of these children, as in the one reported by Geller, have been successfully freed from these tumors, as also happened in the cases of Pitha, Schuh and Blizard. Of eight of these children, five were girls and three boys.

Tittel found a tumor the size of a child's head in the anal region of a girl. It consisted mainly of glandular, reddish masses, between which were arranged cartilaginous layers, and of thin-walled cysts, one of which contained an encephaloid mass, and also of parts of the vertebræ and the intestines. The pelvis of the fœtus was closed, but the vertebral cavity communicated with the interior of the parasitic tumor by means of a fissure corresponding to the os sacrum. The fœtus exhibited well-developed female genitalia and a uterus filled with meconium from the cloaca. The tumor was therefore to be designated as a pyopagus parasiticus.

The Course of Labor.—Although the above-mentioned tumors of the os sacrum frequently attain the size of a man's head, most of the children are born in vertex presentations; only one case (previously described) presented in a face position, and an oblique presentation was observed in Beumer's case. I know of but one case in which the breech with such a tumor was found presenting; it was that of Gilles in Bonn, in which the tumor was a very serious obstacle to delivery. In spite of the displacement of the centre of gravity toward the lower end of the body of the child, most of the children are born in vertex and not in breech presentations, evidently because the breech together with the tumor has not sufficient room in the lower uterine segment and would pull and press upon the latter to such a degree that the uterus would have to react by contractions, until the tumor should finally be brought into a place where it no longer drags upon this organ and also has sufficient room. I must, moreover, lay stress on the fact that a very large majority of the children affected with such tumors were well formed and developed, and that their bodies, with the exception of the anomaly named, exhibited no trace of any diseased state. Only in a few instances was there a retarded development of certain parts of the body.

In spite of the considerable size of the tumors the delivery was terminated successfully by the natural forces in a number of cases, as in the cases of Mauthner, Mombert and Lotzbeck. In some instances it takes place more slowly and with greater difficulty and only after the tumor has burst (*Saxtorph*). Tumors as large as an apple or a man's fist will seldom cause any impediment to the delivery. Most of the children were born alive, evidently because the birth of the head, and frequently also that of the chest, has been accomplished without any trouble, and, half of the child being born, it could breathe vigorously (*Busch's* case). It has sometimes been expelled as far as the hips (*Busch*) before it became necessary to interfere. The recognition of the tumor has seldom been made until after the delivery of the head and trunk, and then only when the obstacle could not be overcome by simple traction. In Beumer's case the tumor was supposed to be the fœtal sac of a second child, and was ruptured; the child, which was in an oblique presentation, was decapitated and delivered by expression. The tumor was as large as a child's head. A well-marked distention of the abdomen, hydramnios, or even the discovery of an apparently fluctuating tumor prove nothing, for we may be very easily led into error. I do not know of a case in which the diagnosis has been made by external examination. The introduction of the hand as high up as possible, the palpation of the tumor and its attachment to the child's body are the only means of establishing the diagnosis. I once made out a spina bifida by palpation in a boy in a breech presentation, but this tumor was easily recognized behind the scrotum; it was only as large as an apple and did not cause any disturbance of labor.

The *prognosis* is favorable for the mother. The tumors being mostly soft, do not produce any contusion to speak of, and their extraction, even when undiminished in size, through the already dilated genital canal is, on the whole, easy. It is not wholly unfavorable for the children, because there are many cases on record (comp. *Lotzbeck*) in which tumors of considerable size, such as cystic hygromata, tumors of intrafœtation, and even a hernia dorsalis, have been completely cured. It is true, however, that in the majority of cases long life is not to be predicted.

Treatment.—Head and arms being born, a simple extraction will often suffice, as in the cases of Slevogt and Pabst; if the obstacle be greater, the tumor will sometimes burst of itself, as in the case of Osiander. In some cases opening of the fluctuating spot by means of a curved trocar is necessary (*Keller's* case). Some authors succeeded in the following manner: they introduced their hand, grasped the tumor and drew it down into the small pelvis, thus, in Saxtorph's case, causing it to burst. Others brought down a foot and thus accomplished the extraction. The blunt hook has also been used to draw down the tumor. In one case, lifting the child against the symphysis sufficed to bring the tumor down into the small pelvis, and it was then easily extracted (*Busch's* case). The reason why such tumors need but rarely be diminished is that they generally follow the breech, and, therefore, even the larger ones find sufficient room alongside of the extremities.

CHAPTER V.

Disturbances of Labor Due to the Presence of Several Fœtuses in the Uterus.

LITERATURE.

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Multiple labors are very frequently abnormal; there is scarcely an anomaly which is not common in twin and triplet deliveries, in fact, even more frequent than in ordinary cases.

I shall, however, confine myself here to the pathological conditions arising mainly or entirely from the coexistence of several fœtuses in the uterus. I include in these: 1, faulty mechanism of labor; 2, the interlacing of the umbilical cords of several fœtuses; 3, double monstrosities.

1. Faulty mechanism of labor with twins.

Apart from the hindrance to rotation and advance which the first child may experience from the existence of a second fœtus in the uterus, I must mention the following as especially productive of fatal consequences: the simultaneous entrance or the simultaneous incarceration of both children in the small pelvis. This may occur as well where both heads present as where the first is a vertex and the second a breech presentation, or *vice versâ*.

(*a*) The head of the child standing the highest may become incarcerated in the pelvis alongside of the head of the first child, which is still in the pelvis, and thereby render the expulsion of the first impossible. In a case of this kind, a IIIpara, treated by Duhamel, he pushed back the head of the second child and extracted the lower one by its shoulder with the blunt hook; it was dead; ten minutes later the second twin was born alive with a flattened head.

(*b*) The head of the second child becomes incarcerated when the head of the first is already delivered, that is, the head and thorax are wedged together at the same time. W. Franke observed such a case in a VII-para, 30 years of age. He extracted the head of the second child with the forceps; both children were, however, stillborn. If in such a painful emergency the shoulder or the axilla of the lower child can be reached, this one should first be extracted; but this contingency is usually impossible, and the extraction of the second child becomes decidedly imperative after overcoming the obstruction, in which event the first child as a rule loses its life. The strong pressure upon the neck of the first child, which is exerted by the head of the second, causes the suffocation of the former. On the other hand, the prognosis appears to be better in case the head of the first child has not as yet advanced very far. Sidey and Simpson and Lewins were successful in delivering two living children by repositing the head of the second child.

(*c*) The head of the second child is incarcerated in the small pelvis alongside the after-coming head of the first one, which presented by the breech.

This anomaly is not as rare as the two mentioned above, but it is very dangerous for both children, not only for the first, which is sure to die in a short time from pressure on the cord, but also for the second. C. Braun found 13 such cases reported in literature; of the 26 children only three, or 11 per cent., were born alive; 89 per cent. were *dead*. The delivery may proceed in such a way that the second child alongside the first is completely expelled by the uterine contractions; this occurred five times among these 13 cases. Usually, however, both children are so firmly wedged in as to require artificial assistance, which is best rendered by applying the forceps to the head of the second child, nature herself teaching that this method is the simplest. If the head cannot by any possible means be extracted by the forceps, it must be perforated and then extracted. Among the 13 cases mentioned above, its extraction by the forceps succeeded five times, perforation was done once, decapitation once and the first child's head was decapitated once.

The latter operation would be the best, if the second child were still alive and could be extracted by the forceps in no other way. Then the neck of the first might be quickly cut through, its head pushed back and a second attempt made with the forceps to deliver the head of the second child; there would then remain the extraction of the severed head.

Rintel's case is worthy of note, inasmuch as he applied the forceps to the head without having the least idea that it was the head of a second child (!!). The simultaneous forcing of the two fœtuses into the small pelvis is sometimes observed at the very commencement of labor, and may hinder the progress of the first stage, in that the sac of one of them enters the pelvis alternately with the other, and parts of one fœtus present to be succeeded by those of the other. A change in the position of the parturient woman may possibly have some influence on this. This course, however, rarely comes under observation, because it generally occurs at the commencement of labor, and therefore at a time before the physician has examined. Such a case is the one reported by Lespinasse; Hecker also called attention to similar cases, and pointed out that, after a first vertex and a second breech presentation have been diagnosticated, the child may descend breech first; such a displacement of the fœtal body under certain circumstances may manifest itself during the delivery and thereby cause considerable delay.

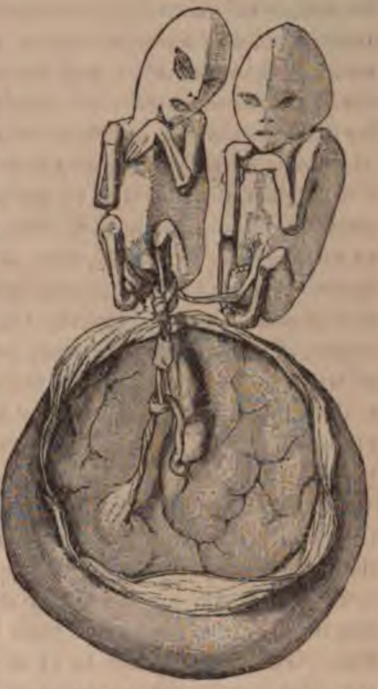
C. Braun advised in an alternating presentation of the children to first rupture the sac of the child in head presentation in order to force it forward and prevent the interlocking of the heads.

2. The interlacing and knotting of the umbilical cord.

Another kind of dystocia in twin-pregnancy arises from the interlacing and knotting of the umbilical cords (Fricker: I. D., Tübingen, 1870; Sedlaczek: "Seltener Fall von Verschlingung und Umschlingung der Nabelschnüre bei Zwillingen," *Archiv für Gynäkologie*, 1885, XXVI, 309; Coen, E.: "Un Caso di attorci gliamento dei cordoni umbilicali con formazione d'un grosso nodo in feti gemelli." *Bull. d. sc. med. di Bologna*, 1887, 6 S., XIX, 29). The course of labor is not, as a rule, materially affected by these accidents, but the children's life is more or less imperilled. Such entanglements of the cords occur very rarely, and, of course, only with such fœtuses as have a common amniotic sac. Fricker's statement, that this entanglement of the cords occurs about once in every 5000 or 6000 deliveries, is too high. He has collated the nine cases known up to 1870. The three cases of Kleinwächter (1871), Sedlaczek (1885) and Coen (1887) have since been added, and I can add to them a fourth and interesting case in which the twin lying on the right side was evidently the culprit.

The mode of such interlacing of the cords varies; in one case there is a partial coiling of one cord around the other (Fricker, Plate II, Fig. 3), in another there is a long, almost complete spiral twisting of the cord of one child around that of the second (Plate I, Fig. 1). Completely formed knots also occur (Fig. 2), these originate either during pregnancy or during the progress of the labor; in the latter case they are not drawn tightly together, but are looser and more movable. The danger of these anomalies for the fœtuses is apparent from the course of these nine cases, in which there were three abortions and two premature deliveries; only one child remained alive. Of four cases of twins born with such entanglements of the cord at the normal end of pregnancy, only two pair were born alive. The practical significance of such cases is proved by the experience of Newmann (Fricker, p. 12; *Edinb. Med. Jour.*, 1858, p. 8); the case was one in which the midwife had pulled hard on the umbilical cord of the first child which was born alive, while the second was expelled livid and dead; it was found that the cord of the first had become coiled around that of the second into a simple knot and had strangulated the latter. Both children were equally mature and well nourished, so that the circulation in the cord could not have been impeded long before death.

FIG. 92.



Entwining of both umbilical cords of twins of 3½ months. ⅔ natural size. Two knots and a coiling of the cord around one leg.

Entwining of the umbilical cords may cause the descent of the cord of the second child during the delivery of the first, thus further imperilling the life of the second child by prolapse of the funis. This occurred three times in these nine cases (*Tiedemann, Soete, Sammhammer*).

It may, finally, be mentioned that the umbilical cord of one twin may rest upon the body of the other child, and thus the former may be placed in great danger in its descent during the delivery, and the latter may be injuriously affected as regards its presentation, position and attitude. A case of this kind has been published by Hugo de Puyt and another by Sedlaczek.

The issue for the child materially depends, during pregnancy, on the thickness of the cords, the tightness and number of the coils, and also upon the fact whether both coils are alike involved.

The origin of these entanglements in the later months of pregnancy explained by the frequent change in the position of one or both children it is unnecessary to assume particular or even extraordinary movements the fœtus. In the earlier months of pregnancy, when the embryo is as y incapable of making very extensive movements, both the varying degree pressure in the umbilical veins, whereby one fœtus may be rotated mc strongly than the other, and the movements of the mother will be favorak for the occurrence of such entanglements of the cord. S. Müller prov by experiments that rapid, violent and continued movements of the ute must exist, if interlacing and knotting of the umbilical cords were to ens

Tiedemann states that in his case the woman was passionately fond dancing, and had danced a great deal, especially during the earlier mon of her pregnancy. Riding over rough roads (Sammhammer), severe and f quent vomiting in the beginning of gestation, especially when the liquor am is abundant, and long umbilical cords, may, therefore, be also considered causes. The diagnosis of such conditions during pregnancy is impossib after the delivery of the first child it can be made only if the tangled porti is drawn down, or prolapses very low, as occurred in the cases of Tiedema (Lucina, III, 19, 1805), Soete and Sammhammer. In the latter placer prævia coexisted.

Treatment.—Newmann's case teaches that in twin deliveries every tug the umbilical cord of the child born first is absolutely reprehensible. It w depend on the presentation of the second child whether, in case its cord drawn down, version should be done, or the child extracted by the feet the head. It is worthy of note that, in a case described by Fricker, tl state physician was able to clear a woman (who had thrown the ovum in the closet) from the suspicion of having produced an abortion by provir that the entwining of the umbilical cords caused the death of the fœtus.

3 Disturbances of Labor due to Double Monstrosities, dystocia e monstrosita duplici.

LITERATURE.

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According to Foerster, so-called double monstrosities may be divide into three chief groups, viz.:

I. Monstra a superiore parte duplicia s. terata katadidyma; here belong diprosopus, dicephalus, ischiopagus, pygopagus: the traces of duplication begin at the head.

II. Monstra ab inferiore parte duplicia s. ter. anadidyma; among which he enumerates: dipygus (double breech), synkephalos, kraniopagus.

III. Monstra ab superiore et inferiore parte duplicia, T. anakatadidyma, including prosopothoracopagus and thoracopagus.

This division is, however, too complicated so far as it concerns the course of labor and brings divers double malformations into one group, which are to be separated from each other in regard to the method of their delivery. The simplest grouping is the one adopted by F. Rouge, as it covers nearly everything. He divides these monstrosities into three groups, viz.: 1, two heads on one trunk; 2, two heads and two trunks; 3, one head and two trunks. Playfair has recently enumerated four varieties of double malformations, viz.: 1, the chest and belly of twins have become united in various degrees; 2, the backs have become united; 3, double heads with single body; 4, heads which have become merged into one with a double body. 1 and 2 belong together and form Rouge's second group; their separation is not required, especially since the cases are rarely met with in which the backs are united together.

All the double monstrosities must originate from one ovum and develop from one germinal vesicle, for which reason fœtuses of different sexes have never been found among them. Marchand thinks that the entrance of two spermatozoa into the ovum—that is to say, the formation of two preëmbryos, or the existence of two female preëmbryos; in other words, that a preëxisting double vesicula germinativa might also have two segmentation centres—give rise to double malformations. O. Hertwig is also of the opinion that polyspermia—that is, the entrance of several spermatozoa into the ovum—may possibly give rise to double malformations. Mechanical, chemical and thermal irritations—such as a blow, traumata, a cooling off of the surface, etc.—may be external causes. Now, if there are in one vesicula germinativa two embryonic spots, they may meet during their growth and very early in their development merge into each other (theory of coalition: *Claudius, Panum, Schultze, Nauber, Marchand*), or within a common embryonic spot at the commencement there are two primitive furrows, formed by division, which cohere to a greater or less degree (theory of division: *Forster, Virchow, Oellinger, Ahlfeld, Gerlach, Donitz, Leuckart*). Perls assumes the possibility of both modes of origin.

I. A double head and one trunk or a double trunk. Diprosopus, kephalothoracopagus (synkephalos, prosopothoracopagus).

In cases of diprosopia, the obstacle to delivery depends on the size of the head, whether the head comes first or last; forceps, perforation or cranioclasis may become necessary.

The same is true of cephalothoracopagus. If the double head and double trunk are small, the monster is expelled spontaneously (see cases of *Derner*, *Schwartz*, *Klauber* and *Mackay* (s. *G. Veit*)); with the larger ones the extraction may be very difficult, and it may be necessary to diminish the size of the monster.

II. Two heads and one trunk (dicephalus dibrachius). Besides the eight cases reported by F. Rouge in 1853—those of Niess, Ratel, Ebermayer, Brunner, Reiteburg-Hesse, Peu, Wolfart and Hueter—five others are known to me, viz.: those of Evers, Ebsworth, Schönfeld, Löscher and Lindemann. Of these 13 births eleven vertex, one face (*Niess*) and one breech presentation have been reported; five of them proceeded normally. The mechanism of labor observed in these deliveries was a double one. In the one case the uterus impels the presenting head forward, while it presses the second one against the neck of the first in such a manner that the second can neither be wedged in at the pelvic inlet nor be separated far from the former, and it is born immediately after the first. When the child is very small, both heads may enter the true pelvis at the same time and descend together. In the other, after the birth of the one head, the first to be forced down into the pelvic outlet, just as in a natural version, is the shoulder; this is wedged in under the symphysis, the breech and the feet follow it, and last of all the second head is expelled.

The children generally die; in only two cases—Wolfart and Ebsworth—have they probably been born alive. In seven of the deliveries it was necessary to use artificial assistance; decapitation of the already delivered head was resorted to four times, after which version and extraction by the feet were possible. The seizure and extraction of the second head succeeded only in exceptional cases (*Hesse*), after the first head, owing to a delay in the delivery, had been extracted by the forceps. However, in the majority of the cases where the second head rests against the pelvic inlet—the first having been born spontaneously or extracted with the forceps—it will be best to introduce the hand and perform version and extraction, unless we can speedily draw down the second head into the small pelvis. Decapitation should only be resorted to, if the child should be very large or the introduction of the hand along the neck of the first head extremely difficult.

The diagnosis of the dicephalus has usually not been made until after the birth of one head, and then only, as a general thing, by the introduction of the half or the whole hand. The attempt to draw down the second head with a blunt hook placed around its neck has now and then been successful; but this method is not to be recommended, because the application of the hook is not easy so long as the first head is not cut off, or it may slip and injure the maternal parts, and, finally, because it is not certain that it will bring down the head. In the single case of pelvic presentation of such a fœtus, described by Lindemann, both heads were simultaneously drawn down into the small pelvis, and then, as traction with the blunt hook was of no avail, one head was decapitated and the trunk extracted with the other one, whereupon the second followed at once. The mothers recovered without injury in most of these cases.

To this class belong also the cases of dicephalus tribrachius, tripus; for instance, the cases of W. Busch and Werner, in which the first fœtus, in a pelvic presentation, was extracted after bringing down the third leg, the second, in a vertex presentation, was extracted by the forceps, the second head being pressed into the belly of the first. In dicephalus tetrabrachius the vertex presentation would be the most favorable, and after the birth of one-half of the breech, the other body might be delivered by rotating it around the symphysis from the pelvic extremity without performing embryotomy.

III. Two heads on two trunks: xyphopagus, thoracopagus, pyopagus, ischiopagus.

Rouge, after a brief notice of the cases of Franzango, Telfair, Gützbach, Moore, Molitor, Tonro, Waljen, Thomson, Regnoli and Duverney (10), also incorporated in his statistics those of Letouzé (1848), Lyell (1848), Prieger (1851), Molas (1822), Mayer (1772), Schöffler, Haller (1735), Lorenz (1822), Rintel (1844), Bock, Werther (1708), in which the first fœtus at least had a vertex presentation. To these I add from recent literature ten cases, viz.: Burg (fœtus on the neck of the first), Leopold, Eagles, Cuchet, Teljer, Sprint, Stuart, Dreissigacker, Levy, and one from St. Petersburg, so that we possess pretty accurate reports concerning 21 deliveries of such fœtuses. Of these 42 fœtuses eight were born alive; part of them lived but a short time and part reached a greater age, such as the celebrated Hungarian twins, Helen and Judith, who were born in 1708.

The mechanism of labor may differ greatly according to the degree of the union. Sometimes both heads enter the pelvis at the same time (*Lorenz's case*), or, as in Mayer's case, one of them precedes, while the other, tightly pressed against the neck or the chest, is incarcerated in the small pelvis (*Haller*). In other cases the head of one child, after having escaped from the genitals, is pushed to one side and upward, then this one's shoulders, breech and feet follow, after which the second child advances with its feet foremost; three deliveries of this kind took place without further artificial aid.

In still other cases—a beautiful example of this kind is the case of Ramis and Breslau (*Mtschr.*, XI, 453, 1858)—the feet of the second child follow immediately behind the head, then comes the trunk with four arms, and last of all the head of the second child, even though the breast bones are united together and the faces are turned toward each other. The children lived eight days. The case of the Sardinian sisters, Rita-Christina, is well known;

they lived more than eight months; in Buchanan's case the children lived 28 years.

In one of the cases mentioned (*Mayer's*), the first child is said to have been in a face presentation; but the origin of this cannot be clearly explained, because of the imperfect description of the case. Such fœtuses have relatively often been born spontaneously, or all the assistance required consisted merely in moderate traction on that part of the first child which was already born.

The *diagnosis* of these anomalies can only be made after the birth of one head. The most natural artificial aid, in case the head should not descend and escape from the vulva, consists in extracting it by the forceps, and, as soon as the cause of the dystocia is ascertained, in bringing down and extracting first the pelvic extremity of the first child and then that of the second, in conformity with the ordinary mechanism of labor. If the introduction of the hand, after the extraction of the first child, should be very difficult, a separation of the fœtuses may be resorted to in cases in which the union between them is not very complicated and extensive; this has been done a few times.

Besides presenting by the vertex, such double monstrosities are quite often met with in pelvic presentations. Altogether, I know of 14 deliveries of this kind, viz., those of Schwarz, Gosselin, Derien, Böhm, Lauts, Brez d'Angers and Moreau, which have been reported by F. Rouge, to which must be added those of Arnison, Hasbach, Hochstetter, Bonini, White, Breslau and Scherer. Both pelvic extremities rarely present as in Moreau's case; two, three or even all four feet are, as a rule, found in the os cervicis. Labor may then proceed quite naturally, as in an ordinary presentation of the pelvic extremity, one head emerging after the other. It is unfavorable if one or two feet remain above the pelvic inlet, especially if the physician, before realizing the condition, has for some time been vainly attempting to extract by the two presenting feet. Nothing remains in this emergency but to bring down the other feet. In a case of Brie's, mentioned by Playfair, it happened that two feet of different children presented, and, since traction on them was unsuccessful, the other two had to be brought down. In regard to any extraction of the children that may become necessary, it is to be borne in mind that the passage of the heads one after the other, in which the posterior one always descends first, is materially hastened by pressing the already-delivered trunks against the mother's belly (*Rouge*).

Two cases of oblique presentation of conjoined twins have been published, one by Pies, the other by Klauber. In the first, the fœtuses were united from the os pubis up to the sternum, and there was a large umbilical hernia lying above the os uteri; version on all four feet was done, followed by extraction. In Klauber's case, the faces and the anterior halves of the thorax were almost entirely blended together, the heads lay to the right and posteriorly, the feet to the left anteriorly; version, extraction and forceps to the after-coming head were necessary.

IV. One head on two trunks: janiceps, craniopagus. In the craniopagus both heads are generally united at the vertex; they may or may not be symmetrical. They have been united much more rarely at the forehead or the occiput. In the first case, the two trunks are in one line; in the two latter, alongside or in front of each other. Hindrances to the delivery are rare—cases of Münster, Klein, Geoffroy St. Hilaire, Albrecht, Villeneuve, Sannie. In Vothem's case, version was performed on account of a shoulder presentation with prolapsed arm.

A case of janiceps has been accurately described by Detharding. In this one, perforation became necessary, then version and extraction of one trunk, after which the second trunk with the perforated head came away easily. Playfair mentions another case in which all the extremities of the child were wanting, and there was a shoulder presentatation; version and extraction were resorted to.

V. Three heads: tricephalus. Two cases of Facello and Reina (Catanea) are found in Froriep's *Neue Notizen*, Bd. III, page 193, 1837, and Bd. XI, July 22d, 1839. Facello's child lived two days, suckled and screamed with all three mouths. Reina applied the forceps and perforated in the delivery of the first head, decapitated it after discovering the second; he also decapitated the second and then the third head, extracting the latter by the finger introduced into the mouth.

Concerning the *prognosis* for the parturient, it is to be considered decidedly good. Among the 61 deliveries spoken of, but one fatal case is known to me—that of Cuchet's. Playfair also remarks that of his 31 cases only one succumbed. This favorable result is, in part, to be attributed to the often imperfect development of the children; although Playfair curiously remarks that in but one instance were the fœtuses to be designated as immature. It is also due to the width of the genitals of the parturient, pluriparæ among them being nearly four times as many as primiparæ.

The thoracopagi are the most common forms of double monstrosities; therefore they claim our attention the most. A case of this kind, sent to our institution in 1885, has been described by Dr. Feibusch ("Zur Casuistik der Doppelmissbildungen," I. D., München, 1885, bei Ernst, mit 1 Tafel). The birth of one head took place first; the midwife and husband pulled on this until it was nearly torn off. A physician was then called in; he discovered the union of the two children, and brought down the feet of the first fœtus, the feet of the second following them, he readily extracted the latter. Both girls were perfectly matured, but had become united from the manubrium sterni down to the umbilicus. The weight of both amounted to 4200 gm. The common umbilical cord had two arteries and two umbilical veins, and was 49 cm. long. I refer to Feibusch's figure for a description of the interesting relations of the vessels and organs. Among 15,000 deliveries I have never observed the birth of a double monster.

(b) Anomalies of Labor dependent on the Mother.

CHAPTER I.

Disturbances of Labor Due to Faulty Structure of the Female Pelvis.

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1. *History* (*after Litzmann*).—It was only after Andrew Vesalius had given a description of the female pelvis which was true to nature, and after the old doctrine of the separation of the os pubis during birth—which had been expressed most clearly by Ætius of Amida (in the sixth century), but was a very old theory—had been destroyed (1543), that his pupil, Julius Cæsar Arantius, of Bologna, could recognize the contracted pelvis (1572) as a very important cause of difficult labor. In the belief in the separation of the pelvic bones during labor, it had been assumed that the causes of difficult labor consisted partly of too firm union of the bones, partly of defective structure of the soft passages. For example, Rousset, in his "Hysterotomotokia," which appeared ten years after the above-mentioned work, was unacquainted with contraction of the pelvis as an indication for Cæsarean section, but merely with anomalies of the soft parts. The difficulty was often attributed to death of the child, a breech presentation, to early escape of the waters, to coiling of the umbilical cord, etc.; cause and effect were often confounded. J. C. Arantius only described flattening of the pelvis from before backward; he found its cause in excessive breadth of the pubic bones, which were pressed in to such an extent from the outside that they formed a projection internally. In 1604 Scipione Mercurio emphasized the incurvation of the os pubis as a cause of difficult labor and as an indication for Cæsarean section; while Ambrose Paré (1573) and Severinus Pinæus (1597), despite their experiments on the cadaver, fell into the old erroneous notion of the separation of the pelvic bones during labor. Pinæus first mentions spinous formations on the os pubis and ischium and consolidation of the sacrum and ilium on one or both sides. Mauriceau, at least, discarded the separation of the pelvic bones as unnecessary and unproven, and recognized the rigidity of the coccyx and the malformed pelvic bones of humpbacks (1668). Heinrich von Deventer (1651–1724) is the true founder of the obstetrical theory of the pelvis. He first described the inclination of the pelvis, the axis of the inlet of the

pelvis, and its individual differences in size and shape (1701). He does not mention the diameters of the pelvis. The false assumption that he had measured the oblique diameters developed, as Litzmann showed, from the wrong interpretation of the lines added by his translator (D'Ablaincourt) to the pelvic figure in the original. Deventer recognized the pelvis nimis parva and the pelvis nimis plana. But he still clung to the wrong notion that the lower part of the true pelvis furnished the chief obstruction to labor. De la Motte was acquainted only with the pelvis plana (1721), of which he described a series of practically interesting observations, but to him belongs the credit of having recognized the pelvic inlet as the main cause of delayed labor. Pierre Dionis (1718) was the first who maintained that the contracted pelvis occurs most frequently in those women who had suffered from rickets in childhood.

The theory of the pelvis was advanced very considerably by William Smellie (1751). He compared the pelvis of children, men and women, described the height of the walls, the shape of the inlet and outlet, measured the straight and transverse diameters, and supplanted Deventer's pelvis nimis plana by the distorted pelvis, which, according to Smellie, meant merely the rachitic pelvis. He described the frequent obliquity of the rachitic pelvis, the lateral deflection of the promontory, and hinted at its transition into the shape of the osteomalacic pelvis by the inward bending of the rami of the pubes and the approximation of the tubera ischii. According to him, deformities of the spine which develop after the eighth year, from improper posture, usually had no influence on the shape of the pelvis.

Levret (1703–1780) was closely acquainted with the rachitic pelvis alone. He maintained that the contracted pelvis is never narrowed in the transverse direction, that the straight diameter of the inlet of the non-contracted pelvis is 5–6 inches, and is one inch larger than the transverse diameter. Rickets is the most frequent cause of contraction of the pelvis. Asymmetry of the rachitic pelvis and the occurrence of contraction of the outlet from posterior displacement of the promontory were known to him.

Roederer (1753) and Deleurye (1770) also mentioned the generally contracted pelvis, the knowledge of which was almost entirely lost at this period.

G. W. Stein, Sr., a pupil of Levret, correctly described (1770) the proportions of the pelvic diameters to one another. He distinguished a pelvis justo minor, with change of shape, also the pelvis complanata (plana) and pelvis compressa; he was also the first in Germany to describe (1782) a case of osteomalacic pelvis, an anomaly which had already been seen by Cooper (1776) and Vaughan (1778) in England.

Thomas Denman made the attempt to ascertain the mechanical principles according to which the pelvis is constructed, but without utilizing these relations in the interpretation of the mode of development of the various forms of the contracted pelvis. He separated the primary small size of the pelvis from distortion, the latter being due to rickets or osteomalacia (1788). In his inaugural dissertation, N. de Fremery (1793) gave an admirable description of the changes in the shape of the pelvis, especially as the result of softening of the bones. He recognized correctly the factors upon which the shape of the pelvis after birth chiefly depend.

Stein, Jr., unlike his uncle, followed Smellie in the main; the description of the ordinary form of contracted pelvis is, in great part, his work. He distinguished the simply too small pelvis, pelvis simpliciter justo minor, from the distorted pelvis, pelvis deformis, and divided the latter into pelvis rhachitica, osteomalacica and localiter affecta. Among the latter he included pelves contracted by exostosis, osteosarcomas, fractures and diseases of the hip joint, and described, in particular, oblique displacement from unilateral coxalgia or unilateral luxation of the femur.

The generally contracted pelvis, which he rescued from oblivion, was described more carefully by F. C. Naegele, who also gave a better description of the obliquely distorted and compressed pelvis.

Kilian (1854) increased our knowledge of the osteomalacic and spinous pelvis (akanthopelys); Rokitansky our knowledge of the influence of hip diseases on the shape of the pelvis; Betschler and Michaelis that of the flat, non-rachitic pelvis; F. C. Naegele that of the obliquely contracted pelvis with ankylosis at the hip joint; they were followed by Hohl, Simon, Thomas (1852), and E. Martin. Robert made us acquainted with the transversely contracted pelvis; Rokitansky, Kiwisch, Lambl and, especially in recent times, F. Neugebauer, Jr., with the spondylolisthetic pelvis.

Distinguished for his historical and clinical investigations, for his exact measurements of the pelvis, and particularly for the description of the course of labor in contracted pelves, is G. A. Michaelis, whose work was not published (1851) until after his death, by Litzmann.

To the Weber brothers and to H. von Meyer (Zurich) we owe more accurate knowledge of the mechanical significance of the pelvis; and, finally, to the most indefatigable worker in this department, the gynæcologist C. C. Th. Litzmann, the exact description of the factors which influence and change the shape of the pelvis and of its modifications in physiological and pathological respects.

Hoening, Braun and Fischel have rendered service in the description of the funnel-shaped pelvis. Litzmann, Neugebauer, Breisky (1865) and others, in that of the pelvis which is narrowed transversely at the inlet by spondylarthrocace lumbalis with lumbosacral kyphosis.

Ahlfeld, Dehn, Freund, Gusserow, Litzmann, Petit, Vrolik and Winkler have secured accurate knowledge of the pelvis inversa or fissa, and Stadfeldt has cleared up the disturbances of labor produced by tumors of the true pelvis.

In very recent times, Balandin, Küstner, Löhlein, Rumpe, Ploss and Skutsch have rendered special service in accurate measurement and diagnosis of the contracted pelvis.

2. *Occurrence, Frequency and Classification of Contracted Pelves.*—The statements concerning the frequency of narrowing of the pelvis are still scanty, and but little serviceable, because they are by far too general. It is only on the basis of careful pelvic measurements of all pregnant and parturient women, and of a consideration of all the factors of importance, that we can arrive at an answer to the questions, how frequently contraction of the pelvis is found in different races, in what regions it is more common than in others, and what are the causes of its abnormal frequency. Clinicians who have not fulfilled the first indication, but have only made measurements of the pelvis in exceptional cases, have no right to a voice in this matter. As a matter of course, this is still more true of the few cases of individual physicians and their experience in private practice. When I hear statements made, such as those I often heard in America, in 1886, that narrowing of the pelvis hardly ever occurs there, I can only say that the clinical observation of normal and abnormal labors is still at a very low ebb in the whole of North America, with the exception of New York, Boston and Philadelphia. Not alone are the majority of obstetrical wards very imperfect, but even in the larger services of this kind, for example, in the San Francisco County Hospital, they are entirely inaccessible to the student, and there is no question of the thorough working up of the material for observation there contained. Some colleagues with whom I discussed this condition on the spot, were compelled to acknowledge the correctness of these statements. So long as it is not proven that, for example, rachitis is much less frequent on the other side of the ocean than on this, so long as thousands upon thousands of accurate pelvic measurements are not adduced, just so long do such statements remain entirely baseless. If I should mention a fact which, at least, makes the not infrequent occurrence of narrowing of the pelvis in America very probable, it is the large number of patients suffering from urinary fistulæ, whose disease has been acquired in labor spontaneously terminating. We must even go a step further, and say, that not alone are regular measurements of the pelvis necessary, but that a certain interest and skill are also necessary. I have referred to these factors in my treatise, "Klin. Beobachtungen zur Dystokie durch Beckenenge," and have shown by various cases that there may even be considerable differences in the results obtained by physicians who are thoroughly skilled in pelvimetry.

The first regular measurements were made, in 1840–1847, by G. A. Michaelis, in Kiel, and he was followed by Litzmann (1848–1886). The latter compared his results in an equal number of labors with those of Michaelis until the year 1861.

Michaelis found in 1000 parturients 131 cases,
Litzmann " 1000 " 149 "

of narrow pelvis, so that these figures approximate very closely. In Rostock I did not find half this proportion, viz., 5 per cent., and in Dresden my assistants and I found only 356 : 10,679, *i. e.*, only 2.8 per cent. Inasmuch as 67–80 per cent. of the labors ran a natural course in Michaelis' and Litzmann's cases, while among our 356 cases 41 per cent. required assistance, we can safely say that more than half the cases of slight narrowing of the pelvis were not accurately recognized, because they produced no difficulty in labor. I can directly prove this statement so far as regards Munich. Among 17,220 labors, Hecker found only 268 narrow pelves, or 1.56 per cent., of which 42 per cent. necessitated artificial aid during labor. That these figures are much below the real truth—although they approximate very closely to the figures in Dresden (2.8 per cent.) and Würzburg (99 : 3267 = 3 per cent.)—is shown by our subsequent observations. After all pregnant and parturient women were carefully examined as regards their pelvic relations, there were found among 1199 births 115 women with contracted pelves (9.5 per cent.), a figure which coincides exactly with those obtained of late years in the Würzburg Clinic (8–10 per cent.), and approaches much more closely to those obtained by Michaelis and Litzmann. It is patent that there are certain local differences in the German States; we need merely refer to the very frequent occurrence of osteomalacia on the Lower Rhine. Nevertheless, this explanation must be employed with caution, as is shown by the conditions in Munich. Here, where the mortality in childhood is so very large—*i. e.*, where death carries off a large proportion of those rachitic children who, in other regions, increase to such an extent the number of difficult labors from narrowing of the pelvis—we would assume *a priori* a much smaller number of cases of narrowing of the pelvis than actually occurs. We shall, therefore, not go too far in making the statement that contraction of the pelvis is present in 10–15 per cent. of all paturient women, but that usually only about 5 per cent. are recognized, even in clinical institutions, on account of its effects upon labor.

Definition of Contracted Pelvis.—Litzmann has already called attention to the fact that, until the time of Michaelis, the notion of contracted pelvis was sometimes extended too widely, sometimes drawn too closely. Too widely, inasmuch as shortening of the conjugate by 5–12 mm. was included in contraction of the pelvis; too closely, inasmuch as only those cases were included in which a direct mechanical obstruction was produced. We must coincide with Michaelis and Litzmann in assuming the beginning of obstetrical narrowing of the pelvis when the conjugate of the flat pelvis is shortened to $3\frac{1}{2}$ inches, or, in round numbers, 8.5 cm. In this lowest grade, however, a mechanical obstruction to labor is hardly ever observed, although an influence is exerted upon the mechanism of labor; it is only in unfavorable complications (pendulous abdomen, large fœtus) or presentation of the child, th very notable disturbances of labor may develop. But in other forms narrow pelvis, or in the generally contracted pelvis, serious difficulty in lab may arise even from a lesser shortening of the conjugate. Here the boundar is drawn with greater difficulty, yet a shortening of all diameters by 5 m would hardly produce any difficulty of labor. Here, as in the flat pelvis, i is naturally assumed that under other normal conditions—*i. e.*, normal vig of the pains and size of the fœtus—its position and presentation are als normal.

The frequency of the various grades of narrowing of the pelvis wa observed in Schleswig-Holstein by:—

MICHAELIS.	LITZMANN.	
8 pers. with 9 lab. = 6.1%	8 pers. with 20 lab. = 5.3%	with a conjugate belo 3″ = 7.2 cm.
30 " " 38 " = 23.0%	37 " " 40 " = 25 %	with a conjugate o 3″ — 3″ 3‴ = 7.2— 7.75 cm.
93 " " 104 " = 71.0%	104 " " 120 " = 70 %	with a conjugate o 3″ 4 — 6‴ = 8.8 cm.
131 pers. with 151 lab.	149 pers. with 180 lab.	

Both authors, accordingly, obtained results which coincide very closely. I observed:

	In Dresden.	*In Munich.*
A conjugata vera as low as 9.5	181 = 33.0 per cent.	81 = 70.4 per cent.
" " " " " 8.	88 = 30.4 " "	30 = 26.0 " "
" " below 8.	18 = 6.3 " "	4 = 3.6 " "

The 286 pelves in Dresden were simple and rachitic flattened pelves; in addition, there were:—

Generally contracted, rachitic and non-rachitic, uniform and non-uniform,	5 = 1.6 per cent.
Obliquely contracted,	6 = 2.0 " "
Transversely contracted at the outlet,	1 = 0.33 " "
Olisthetic pelves,	2 = 0.66 " "

In Munich I found—

Generally contracted,	1 = 0.87 per cent.
Obliquely contracted,	4 = 3.5 " "
Osteomalacic,	1 = 0.87 " "

In Munich the proportion of rachitic to non rachitic pelves was 1 : 2.6 (32 : 83). The figures of various authors show considerable differences, especially in regard to the frequency of the generally contracted pelvis which I found only six times in 415 cases, *i. e.*, 1.4 per cent.; Weidling (Halle Clinic) found a proportion of 14 : 106 = 13 per cent. (!), or twice as often as P. Mueller in Berne, who found 6.4 per cent. Gœrmer thinks that he has found the highest proportion of generally contracted pelves. In Basle he mentions 45 cases among 193, *i.e.*, 23.3 per cent., and claimed that the uniformly generally contracted pelvis offers but slight difficulty in labor. This coincides with the statement of P. Mueller, who thought that he had found the reason for this fact in the relatively small size of the otherwise mature fœtus. To these conditions may be due the fact that the diagnosis of the generally contracted pelvis, especially of the slightest grades, is made much less frequently.

But when I find, in a few reports, even much higher figures for the generally contracted pelvis, the explanation can only be sought in an unusual definition which does not agree with that given above. Otherwise, we would have to attribute to mere errors of observation statements, such as those made by E. Bidder (Gebaeranstalt des Kaiserlichen Erziehungshauses, 1870—1877). Among 10,654 cases of labor, he found :—

Only 142 with contracted pelvis, ...		= 1.3 per cent.
Among these, simple flat, ...	50	= 35.2 " "
rachitic flat, ...	5	= 3.5 " "
generally contracted, ...	75 (!)	= 52.8 " "
" " (rachitic), . .	7	= 5.2 " "
funnel-shaped, ...	4	= 26.8 " "
lumbo-sacral kyphotic, ...	1	= 0.7 " "

From 1845–1859 Hugenberger, in St. Petersburg, found among 8036 cases of labor only 94 or 1.2 per cent. with contracted pelvis, and among these 45 or nearly 50 per cent. (!) with generally contracted pelvis, 24 flat and only 18 (!) rachitic pelves. His statements agree, therefore, in a remarkable manner with those made by Bidder, nevertheless I must regard them as useless, for the reasons formerly mentioned. I have not the slightest doubt that after Balandin has carried out his exact measurements in St. Petersburg for a greater number of years, we will obtain entirely different results with regard to narrowing of the pelvis, its frequency and forms.

The theory of a marked separation of the pelvic bones in labor has long been abandoned; yet the pelvis of pregnancy is not a rigid, unyielding canal, and this assumption contains a grain of truth.

Wm. Smellie had recognized the pathological conditions of the pelvic articulations as the result of labor, and said in addition: "In some women, indeed, a sort of indistinct movement may be felt when the head of the fœtus is forced into the pelvis by vigorous pains. The union of the sacrum with the iliac bones and also the rami of the pubes seems to yield somewhat less, and to conform somewhat to the shape of the head when it is pushed downward and passes through the pelvis, but the bones are not separated from one another to any considerable extent." Levret shares this opinion, but it is disputed by Kilian. Lenoir and Credé expressed themselves very decidedly for a constant dilatation during labor. Luschka and Schwegel, on account of their measurements, denied any increase of size during labor as the result of mobility of the articulations. Laborie found that enlargement at the superior strait may hardly be said to exist, but detected a so much greater increase, two centimeters or more, at the pelvic outlet. Zaglas and Duncan demonstrated, as the result of moistening of the articulations during pregnancy, a possible movement of the iliac bones on the sacrum around a transverse axis situated at the level of the second sacral vertebra, so that both iliac bones can rise and fall in a sagittal direction. In elevation of the symphysis the inclination of the pelvis is lessened, and the straight diameter of the entrance is diminished by 4-6 mm.; at the same time the corresponding diameter of the outlet is probably enlarged by twice this amount.

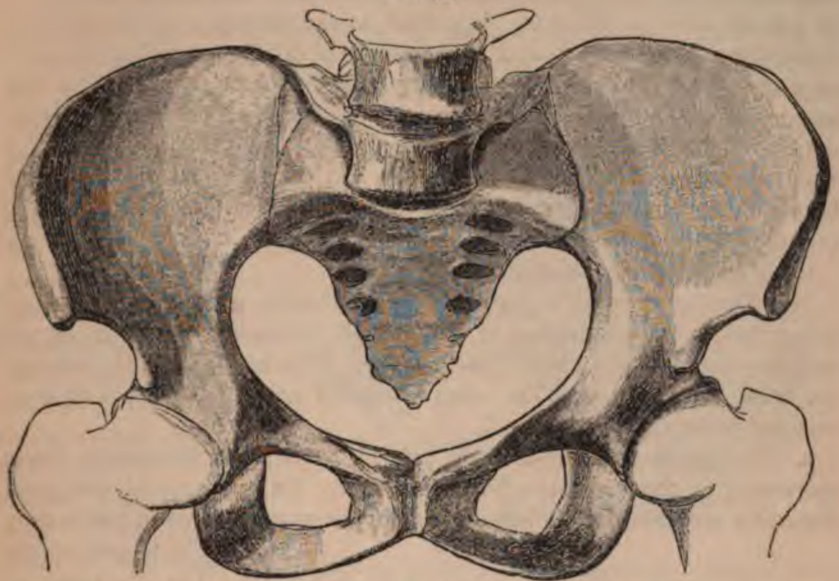
Balandin has resumed these investigations, and tested them upon the pelvis of advanced pregnant and puerperal women, and in all has confirmed the circumscribed mobility, more or less pronounced, in all the joints. In addition to the movements observed by Duncan, he also noted movement of the ends of the symphyses upon one another upward and downward, forward and backward, with corresponding movements in the two sacro-iliac regions. This depends upon the physiological softening of the synchondroses, and renders possible a change of size which, at the entrance of the pelvis, is too slight to be of practical significance; but, at the outlet, renders possible an increase of size which is useful in the course of labor, *i. e.*, an accommodation of the pelvis to the child's head, as Wm. Smellie taught. The statements of Korsch, according to whom a considerable enlargement of the straight diameter (maximum 9 mm.), and the transverse diameter (maximum 6 mm.) is possible at the superior strait, are disputed by Balandin, who explains them by the greater force employed by Korsch and by the different mode of examination. The statements of Korsch concerning the greater dilatability at the outlet of the pelvis in the transverse diameter (maximum 24 mm.) as compared with the straight diameter (maximum 9 mm.) are also regarded by him as unreliable. On the average, Balandin found an enlargement of 1–1½ cm. in the straight diameter from the symphysis to the tip of the sacrum, of 5 mm. in the spinal line and an average increase of 4–5 mm. in radius.

With regard to the classification of narrowed pelves, we follow Litzmann and distinguish: —

(*a*) Narrow pelvis without change of shape.
  I. Uniformly contracted pelvis.
  II. Dwarf pelvis.
(*b*) Narrow pelvis with change of shape.
  III. Simple flat pelvis.
    Flat, non-rachitic.
    Flat, rachitic.
    Generally contracted, flat.
  IV. Obliquely distorted pelvis.
    By spinal curvature.
      Kyphoscoliotic.
    By imperfect or abolished use of one lower limb.
      Coxalgic.
    By asymmetry of the sacrum.
      Synostotic.
  V. Transversely contracted pelvis.
  VI. Funnel-shaped and lumbo-sacral kyphotic pelvis.
  VII. Compressed pelvis.
    Rachitic.
    Osteomalacic.

VIII. Spondyl-olisthetic pelvis.
IX. Pelvis narrowed by exostoses, fractures and bony tumors.
X. Fissured pelvis.

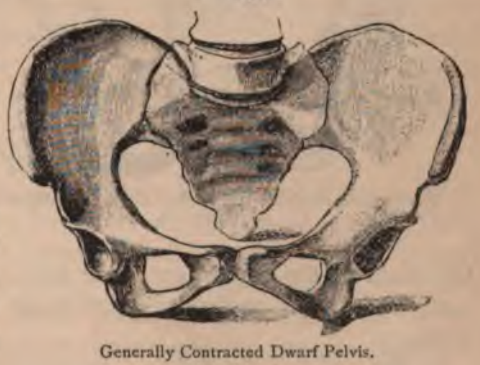
FIG. 93.



Uniformly Contracted Pelvis (pelvis æquabiliter justo-minor). Conjugata vera 8 cm., transverse 11.5 cm., diagonal 10.5 cm.

3. *Description of the Individual Forms.*—(*a*) In the narrow pelvis without change of shape, we find the regular female shape with diminished measurements. There are two varieties:—

FIG. 94.



Generally Contracted Dwarf Pelvis.

I. The reduced uniformly contracted pelvis is the more frequent. The bones are small, fine, delicate. It is found chiefly in small individuals, but also in moderately large and tall women (Fig. 93).

II. The simple narrow pelvis in very small persons and dwarfs. The bones resemble those of the child in size and thickness, often also in the mode of union (Fig. 94).

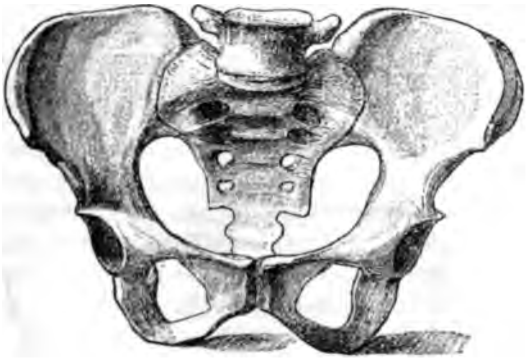
In these forms the degree of narrowing may vary from several millimetres to 3 cm., but the narrowing is not exactly proportionate in all diameters nor equally great at all levels; the variations are numerous and the pelvis is of narrowed chiefly at the outlet. In both forms the growth of the pelvic bo has ceased at an early period. The sacrum is usually narrow, the wings especially small (Fig. 93), the length of the sacrum and that of the corr of the last bone is also less. Inasmuch as the sacrum is usually inclin forward to a slight extent, and its concavity is usually somewhat increa in a transverse direction, the pressure of the weight of the trunk has acted with the normal force, perhaps on account of premature conso dation of the sacral vertebræ (Fig. 94). The slight inclination of anterior pelvic wall to the conjugata vera and the tolerably great distan between the posterior ends of the ilia characterize these forms which par present conditions that are found in the infantile pelvis.

(*b*) Narrow pelvis with changed shape.

III. The flat or straight, narrow pelvis. Flattening of the pelvis fr before backward, shortening of the straight diameter, especially at t superior strait, are the chief characteristics. This pelvic anomaly is by the most frequent one. The other diameters are either normal or ev enlarged or very little shortened.

a. The simple flat, non-rachitic pelvis (pelvis plana Deventeri) sho shortening of the conjugate, but at all levels the oblique and transve diameters are considerably larger than in the normal pelvis in comparis with the conjugate of t inlet. The bones are e tirely normal. The sacru is usually narrow; the si walls of the lesser pel and the symphysis pu are usually lower than the normal pelvis (Fig. 95 The position and inclin tion of the venters of th ilia are normal. The s crum is pushed forwa and downward between th iliac bones without marke rotation around its tran verse axis. The causes this shape of the pelvis cannot be inferred either from the bones or th previous history; perhaps they are to be looked for in hard work durin youth.

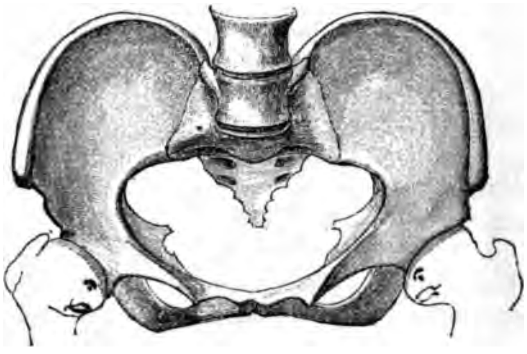
FIG. 95.



Non-rachitic, flat pelvis (pelvis plana Deventeri), somewhat asymmetrical.

β. The rachitic flat pelvis. In this pelvic anomaly the texture of th bones externally is usually not abnormal. All the individual parts a smaller than normal; the sacrum is pushed forward and downward; i vertebral bones are pushed further forward between the wings; the lower ones are often inclined more strongly against the upper ones, because the former are held firmly anteriorly by means of the ligamenta sacro-tuberosa and sacro-spinosa. As a general thing, the venters of the ilia are inclined more strongly toward the horizon, separate more anteriorly, are less curved, so that the distance between the anterior superior spinous processes is usually greater than normal and but little less—equal to or even greater—than the distance between the crista ilii. The pubic arch is wide, the tubera ischii usually widely separated and pushed forward (Fig. 96). The pelvic inlet is often kidney-shaped, transversely elliptical, of a broad heart shape. Even apart from scoliosis of the vertebral column, the two halves of the sacrum are often asymmetrical, the sides of the inferior pelvic ring of unequal width. On account of the rachitic disease of the bones, the sacrum is pushed so far forward and downward by the pressure of the weight of the trunk that it is also rotated considerably around its transverse axis. With this occurs traction on the wings of the sacrum and increased tension of its suspensory ligaments, so that the posterior extremities of the ilia are approximated, the pelvic ring stretched more in a transverse direction, and the venters of the ilia are made to gape more anteriorly. The latter are also pushed outward by the usually very distended intestines and are inclined more toward the horizon. The tubera ischii are drawn upward and forward by the traction of the rotators of the thighs, because they are stretched abnormally, on account of the pushing upward of the head of the femur in the acetabulum.

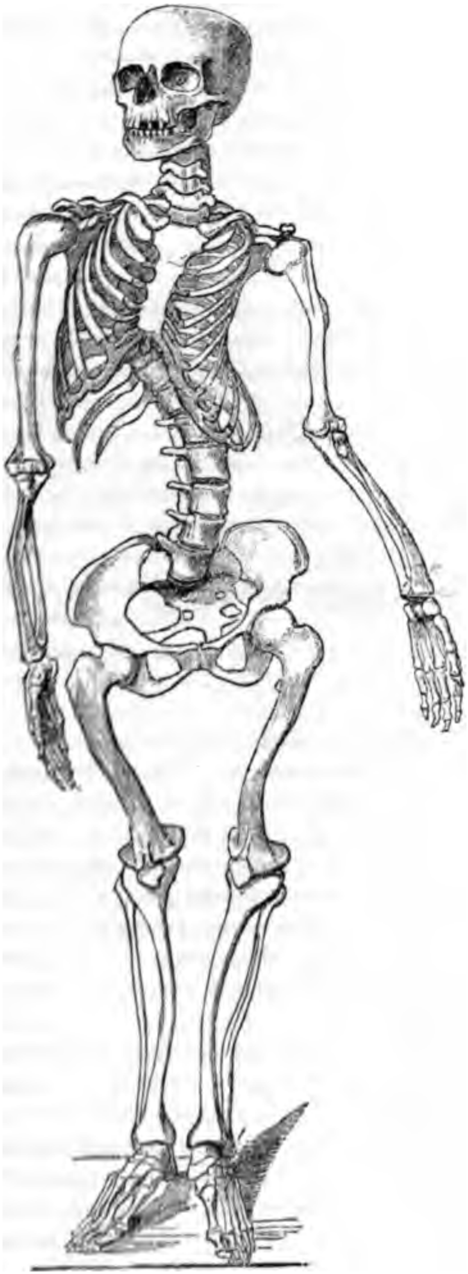
FIG. 96.



The rachitic, flat pelvis with double promontory: Conjugata vera 7.3 cm., inferior conjugate 6.9 cm., transverse 13.5 cm., diagonal 11.8 cm. (Collection 346).

γ. The generally contracted flat pelvis shows chiefly flattening in addition to general narrowing of the pelvis; it occurs with and without rickets. These pelves show, in fact, a mixture of primary small size (pelvis justo minor) with rachitis (vide Fig. 97) or without rachitic deformity, because the rickets was cured earlier; in fact, these pelves are very much deformed in the different bones, especially the rami of the pubes, and thus become similar to osteomalacic pelves. In addition to the pronounced interference with growth, this variety is probably due chiefly to marked pressure, exercised during the disease, by the heads of the femurs upon the lateral portions of the pelvis,

FIG. 97.



Skeleton of Barbara Meisel. Delivered by Cæsarean section (1866). Generally contracted, flat and obliquely distorted pelvis.

whereby the lateral walls are
tened and the pelvic ring is m
more pointed anteriorly tow
the symphysis pubis.

IV. The obliquely disto
pelvis.

(*a*) The most frequent c
of oblique distortion of the
vis is lateral curvature of
spine, usually of rachitic or
(lordo-scoliosis). The sp
column is usually rotated aro
its axis (Fig. 97). The sac
has deviated to the side oppc
to the deflection of the lum
vertebræ and a marked prc
nence of its lateral wings on
convex side is noticeable.
femur on the side of the lum
curvature is raised upward, b
ward and inward from the
tabulum, the symphysis pub
pushed over to the other si
the floor of the acetabulun
pushed aside anteriorly and
ward, the ilium of this sid
situated somewhat farther
teriorly than the other (
98); it is more vertical
curved less or more stron
The wings of the same side o
sacrum are usually narrower,

MEASUREMENTS.

Spinæ ant. sup.,	23
Cristæ oss.,	21
Conj. vera,	5
" diag.,	7
Transverse diameter,	12
Right oblique "	11
Left " "	11

Width.

Straight diameter,	8.
Transverse "	11
Right oblique "	11.
Left " "	11.

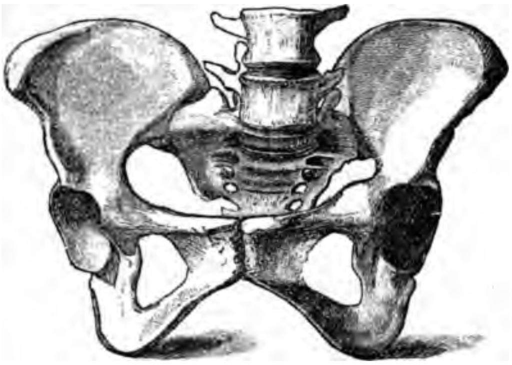
Narrow.

Straight diameter,	8.
Transverse "	10.

sacral foramina also narrower. The pelvis is obliquely displaced and at the same time somewhat flattened. As a rule the anterior surface of the sacrum is not concave transversely, but is rarely strongly bent inferiorly.

(*b*) Oblique distortion resulting from unilateral disease of the hips or thigh. In unilateral coxalgia the obliquely displaced femur of the diseased side is usually very much wasted, the rami of the ischium and pubis and the crest of the ilium are very thin; the linea arcuata interna is obliterated in great measure (Fig. 99). The diseased hip is pushed out from the symphysis pubis and its anterior half is more arched. The ilium is more vertical than usual, because the action of the iliacus internus is increased on account of the inactivity of the glutæi. The tuberosity of the ischium is rarely pushed outward, usually inward and upward; this results either from shrinking of the acetabulum or the permanent position of the thigh upon the pelvis. The healthy half of the pelvis is flattened and narrowed, the diseased half is hollowed out and dilated. This oblique narrowing may extend to the outlet, or the displacement and narrowing may gradually diminish, or the direction of the displacement may be reversed at the outlet as the result of the atrophy of the bones of the diseased side (Fig. 99). The same effect is produced by amputation of one lower limb or an old dislocation; and finally, in comminuted fracture of one ilium the pelvis may be distorted obliquely during recovery (vide the illustration under No. X and Laforgue, *L'Union Méd.*, 1863, No. 68).

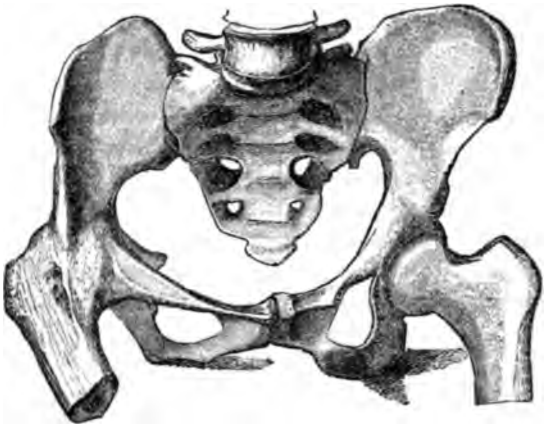
FIG. 98.



Rachitic, flat, asymmetrical pelvis with double promontory.

(*c*) *Obliquely distorted pelvis from asymmetry of the sacrum.* Litzmann also assumes three forms in this category; either there is found an imperfect development with secondary ankylosis and displacement, or asymmetry and secondary displacement of the pelvis occurs from premature union of both facies auriculares, or finally caries and loss of substance give rise to asymmetry with secondary displacement and secondary ankylosis due to the caries. The view, that the displacement is primary and the ankylosis secondary, is often favored by the position of the sacrum as regards the auricular

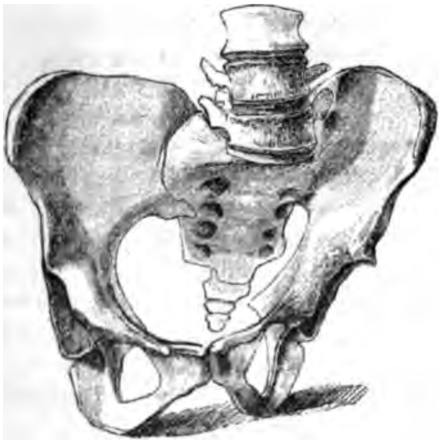
FIG. 99.



Pelvis obliquely distorted by coxarthrocace. Displacement at the inlet toward the right, at the outlet toward the left.

surface of the ilium. In addition, deficiency of centres of ossification in the wings of the sacrum of the new-born occurs not infrequently. Then, a matter of course, the body must rest chiefly on the side of the sacral atrophy order to maintain equilibrium, a this gives rise to the synostosis w and after the pressure displacemen The surfaces of union are small the course of the synostosis is oft indicated by a ridge, the osseo tissue is denser. The synosto femur is pushed upward, inwa and backward from the acetabulum. The symphysis pubis is displaced toward the opposite sid the tuberosity of the ischium i pushed inward with the acetabulum. The difference between th oblique diameters is very considerable, the transverse diameter are relatively shortened, the atrophy of the wings of the sacrum is very considerable; this results from the primary small size and from pressure atrophy (Fig. 100).

FIG. 100.



Pelvis distorted obliquely by synostosis sacro-iliaca sinistra. Left oblique diameter, 12 cm.; right, 8.5 cm.

Since the publication of the classical treatise of F. C. Naegele, who described 29 obliquely distorted pelves, Simon Thomas has collected 21 such cases. In 27 of these 50 cases the clinical histories were too incomplete, and residua of the condition were not present. Simon Thomas maintained that the ankylosis is primary, that it results from inflammation, and that it terminates in atrophy or retraction of the deformed bones; the absence of the wing of the sacrum is only apparent.

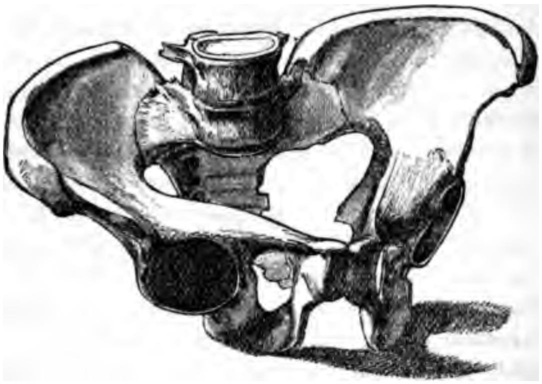
Among the different varieties of the obliquely distorted pelvis, Litzmann distinguishes three main types:—

1. The displacement is tolerably uniform in all planes, while the narrowing increases abnormally in a transverse direction toward the outlet. This is usually the case in the synostotic pelvis.

2. The displacement gradually diminishes toward the outlet, with increasing dilatation of the pelvic space, when the tuberosity of the ischium on one or both sides is drawn outward and forward. Apart from narrowing due to lateral curvature of the spine and coxalgic oblique deformity, this is found in narrowing from primary deficiency of the sacrum, when synostosis has not developed.

3. The displacement is reversed in the pelvic cavity, so that the oblique diameter of the pelvic outlet corresponding to the longer diameter of the oval in the pelvic inlet is the shorter, the other diameter is the longer. This form is very rare, and occurs only in the coxalgic pelves, in which the tuber ischii of the healthy side is pushed outward, that of the diseased side is pushed inward and backward (*vide* Fig. 99, p. 470).

FIG. 101.



Reossified osteomalacic pelvis of Mrs. Scheure, described in *Monatsschrift*, XXIII, 321.

In the pelvis obliquely distorted by synostosis, the deformed ilium is less excavated, is flatter, the linea innominata is therefore not curved, while that of the other side is flatter in its posterior half, but is more strongly curved in the anterior half. Hence the sacro-cotyloid distance is enlarged on the healthy side (*vide* Fig. 101).

V. The transversely contracted pelvis.

This form of narrowing of the pelvis is very rare, and was first recognized in 1842 by Robert. For a long time there were only 4 pelves of this kind, in Würzburg, Kiel, Paderborn and Pavy, to which Lambl added a fifth.

The transversely contracted pelvis exhibits bilateral synostosis, and those changes of the ilia and wings of the sacrum on both sides which are exhibited on one side alone by the pelvis distorted obliquely by asymmetry of the os sacrum, viz.: straight, slightly curved femurs, which meet at an acute angle at the symphysis pubis. The sacrum is very narrow, its wings have disappeared on both sides, so that it forms a quadrangle, not a wedge; it is almost straight from above downward; the anterior wall of the vertebral bodies appears very convex. The ilia extend posteriorly considerably beyond the sacrum, at the same time the promontory approaches the symphysis. This variety is due to anomalies in the position of the sacrum and its articulation with the ilium (*Graf*, *Centralbl.*, 64, 16).

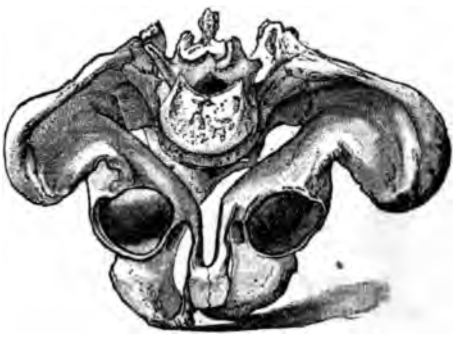
If the synostosis does not occur bilaterally until later in life, it has no influence, as a matter of course, upon the shape of the pelvis, as is shown distinctly in Fig. 106.

VI. The irregularly compressed pelvis.

(*a*) Among the generally contracted, flat pelves we have already, in passing, referred to a form of narrowing which, being due to rachitis of the later years of childhood, is very similar to the osteomalacic pelvis. This is also called the pseudo-osteomalacic pelvis, but has no connection with osteomalacia proper. In the highest grades of rachitis, when the children are again attacked at a time when they have commenced to walk and the ossification of the pubis, ischium and ilium has not yet occurred, the pressure of the heads of the femurs against the lower pelvic half-ring and the coincident pressure of the weight of the trunk upon the upper ring may make the anterior pelvic wall pointed, press the acetabular region inward, push the promontory downward and rotate the sacrum around its transverse axis. Finally, after prolonged stay in bed the outlet of the pelvis may be so narrowed by pressure against the tubera ischii, and the sacrum may be so bent upon itself that the folding-in of the pelvis on all sides exactly resembles that which results from osteo-malacia. Microscopical examination of the bones, however, shows that they are rachitic and not osteomalacic.

(*b*) At first the osteomalacic or halisteretic pelvis is also chiefly narrowed transversely, but the other diameters are also narrowed and the deformity is general. The first changes are exhibited in the anterior wall of the pelvis, because this is first softened to such a degree that it may yield, probably because the bony arches in this region are the thinnest in the pelvis. The acumination of the lower pelvic half ring by the pressure of the still healthy heads of the femurs is associated with a displacement of the anterior pelvic wall backward and upward. Fig. 101 shows these changes very distinctly. At the same time the weight of the trunk acts through the spinal column upon the sacrum and forces it downward and forward. During this descent it rotates upon its transverse axis, the wings are distended (Fig. 102) and pushed farther toward the body. At this time, as a general thing, walking is already interfered with, the patients take to bed, and now is added the pressure against the pelvic outlet, the tubera ischii and the tip of the sacrum; this not alone narrows the already diminished pubic arch by approximation of the tubera ischii, but in the highest grades converts it into an 8. This pressure also pushes the lower half of the sacrum against the depressed upper half in such a way that their surfaces almost come in contact; when the narrowing is very considerable, it is hardly possible to introduce a finger even into the pelvic outlet (Fig. 103). With the increasing softness of the vertebræ these are compressed more and more, the promontory passes deeper into the pelvis, the symphysis becomes higher, so that finally it may also touch the body of the fourth or even the third lumbar vertebra. According as the patient lies more on the back or on one side, an action may proceed from the latter. The side upon which the patient lies for the greater part of the time, is generally narrowed to a greater extent. The iliac sulcus, iliac furrow (Fig. 102), upon which Kilian lays so much stress, is not constant; it may occur on one or both sides, but may be entirely absent (Fig. 101). Finally, in addition to direct pressure from without, the prolonged action of certain groups of muscles must be made responsible for the different variations in the findings in osteomalacic pelves.

FIG. 102.

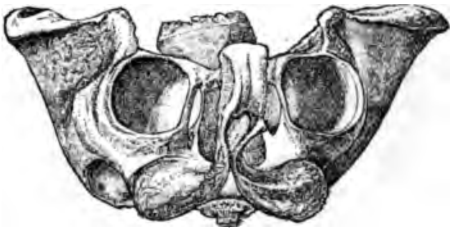


Osteomalacic pelvis, seen from above in order to demonstrate the beak. Mrs. Haarhaus, described in *Monatsschrift*, XXIII.

VII. The spondyl-olisthetic pelvis.

H. F. Killian first described this affection of the pelvis. It consists in a displacement of the body of the fifth lumbar vertebra across the base of the first sacral vertebra, so that the inferior surface of the former gradually reaches the anterior surface of the latter, with which it enters into a more or less firm, often synostotic connection (Fig. 104). Such a displacement would be inconceivable unless an abnormal prolongation of the lateral inter-articular portions of the last lumbar vertebra occurred. This results form abnormal stretching at a period when these bony parts are still rather yielding,

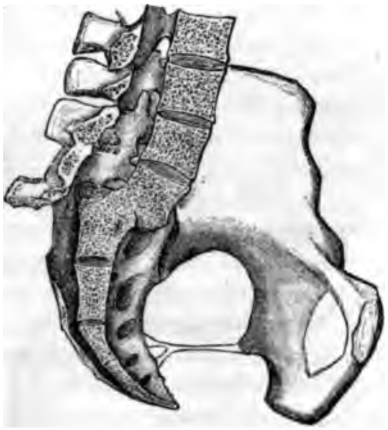
FIG. 103.



Osteomalacic pelvis of Mrs. Haarhaus, seen from the front. 8-shaped pubic arch.

or from inflammatory processes in these parts which have made them m yielding after their firm ossification, or finally, from direct injuries, especia fractures. The credit of having explained these conditions belongs mai to F. L. Neugebauer, and Lambl's attempt to prove all these stateme incorrect must be regarded as uns cessful, inasmuch as we have been a to verify them upon different pelv

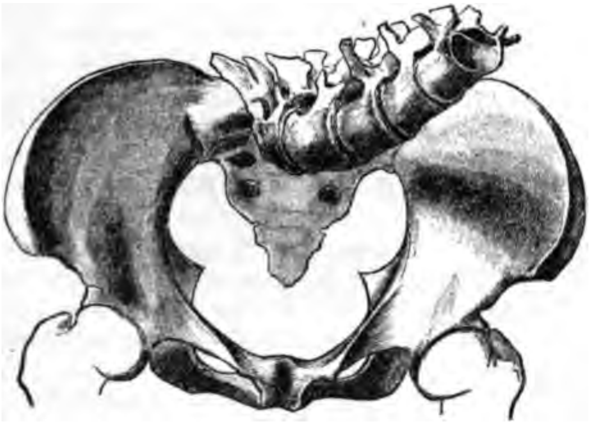
FIG. 104.



The Munich Spondyl-olisthetic Pelvis (published by Lambl in Scanzoni's "Beiträge," III, pp. 14-25).

In both of my cases injuries (a fall) an early period (æt. eight and sixte years) must be regarded very probal as the causes. On account of the d placement of the lumbar vertebræ i the lesser pelvis, the third or even t second lumbar vertebra may be si ated opposite the symphysis, beca the latter is pushed upward at the sa time by the pressure of the heads the femurs. The upper half of t sacrum moves backward and outwar its lower half moves forward; as a r sult of this and of the displacement the anterior pelvic wall the pelvic inlet is narrowed considerably (Fig. 105

FIG. 105.



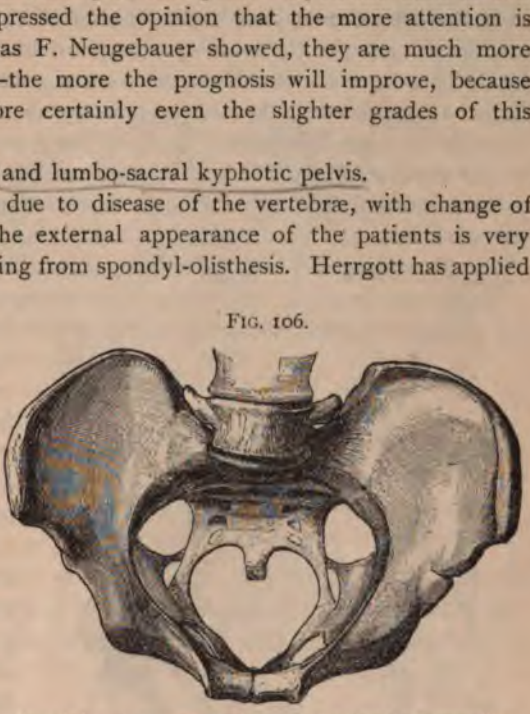
The same, seen from above.

The union of the sacrum with the ilia must also be loosened on account the rotation around the transverse diameter experienced by the latter. Th anterior rim of the promontory meets with a different fate. This may be pe fectly sharp despit considerable dis placement of the fift lumbar vertebra, o it may be somewha rounded, or the up per half of the firs sacral vertebra in it longest diameter ma be very much dimin ished in size, in par destroyed; *i. e.*, i may be made partl to disappear by de struction or by a inflammatory proces (*vide* Fig. 104). This explains the fact that the narrowing of the pelvis varies greatly in spon dyl-olisthesis, and that the extent and significance of the obstruction evidently depend upon the degree of lordosis, the condition of the first sacral vertebra and the degree of downward sinking of the spine. Upon the basis of two observations I formerly expressed the opinion that the more attention is paid to such pelves—and as F. Neugebauer showed, they are much more frequent than is believed—the more the prognosis will improve, because we will recognize the more certainly even the slighter grades of this pelvic anomaly.

VIII. The funnel-shaped and lumbo-sacral kyphotic pelvis.

In the contracted pelvis due to disease of the vertebræ, with change of shape and displacement, the external appearance of the patients is very similar to that of those suffering from spondyl-olisthesis. Herrgott has applied the term spondyl-izema, sinking of the vertebræ, to the condition present in them. The lumbar spine is found to be curved forward more strongly than usual, and is lordotic; the sacrum is more convex to the outside and higher posteriorly than usual. The inclination of the pelvis is very much diminished; the pubic arch has become very narrow on account of the approximation of the tubera ischii; the lower half of the sacrum is very little bent; its exterior wall is excavated normally; an angle from sliding is not present, the promontory is high, the kyphos is situated at the last lumbar vertebra; the distance between the anterior superior spinous processes and the crests of the ilia is greater, that between the superior posterior spinous processes is smaller than usual. The transverse narrowing of the pelvic outlet as the result of caries and kyphosis was recognized as early as 1861 by Litzmann, and was also described in 1863 by Neugebauer. But the exact description of the character and mode of development of this kyphotic pelvis and its separation from the spondyl-olisthetic pelvis we owe to Breisky, who, in 1865, proved that all the above-mentioned findings were due to the changed pressure of the weight of the trunk on the upper extremity of the sacrum. Until the summer of 1882 I was able to collect from the literature 21 cases of this form of contraction of the pelvis.

FIG. 106.



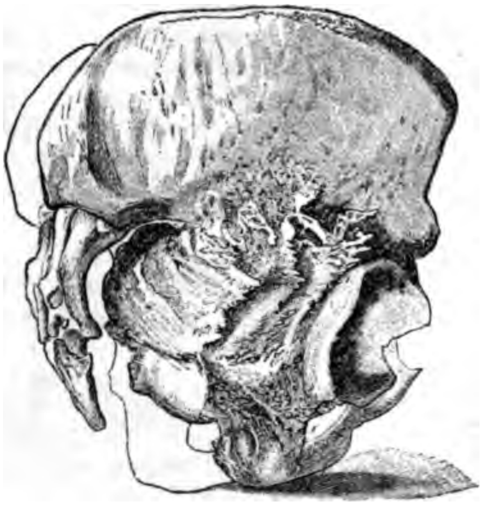
Funnel-shaped contracted pelvis. Synostosis of both sacro-iliac articulations. Munich collection.

In the kyphoses due to rickets the pelvis resembles that just described, except that the sacrum is not concave anteriorly, but is flat or even convex and the venters of the ilia are small and flat. All diameters dim passing downward, so that the pelvis is contracted in a funnel sha 106).

In dorso-lumbar kyphoses the pressure of the weight of the trui tendency to sharpen the kyphosis downward and backward, so that tl part of the sacrum is pushed backward and extended; the lower pai further to the front. The ossa innominata are separated above in a manner, are placed at a lesser angle to the horizon, and are brougl to one another below. Thus the transverse contraction of the pelvi and the shortening of the conjugate are combined with the funnel : the pelvic cavity.

IX. Narrowing of the pelvis from exostoses, tumors and fractures.

FIG. 107.



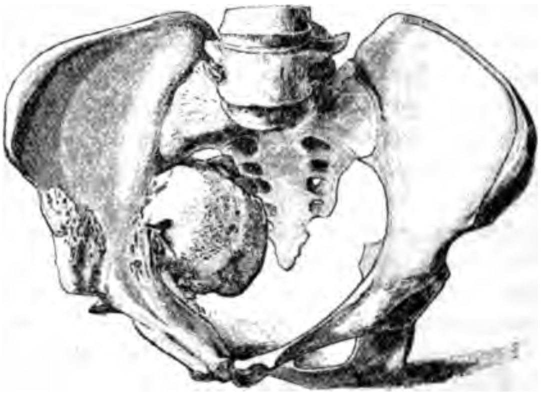
Periostitis, with numerous exostoses of the inner side of the right os innominatum. Munich collection.

In the spinous pelvis, akanthopelys, sharp edges and spines are fou the crest of the pubis, the promontory, sacro-iliac articulations or th ina ovales. Exostose teophytes (Fig. 107) a frequent upon the ili particularly upon the At the symphysis S found a plano-conve occupying the entire of the symphysis, 1″ i 1″ 5‴ wide; it proje 5 and 4‴ into the co of the inlet, the wid narrowest parts of the In our collection is a cially interesting case in Figs. 107 and chronic periostitis, w siderable exostosis.

Fractures of the pelv may recover by disl and may give rise to v siderable narrowing of the most varied kinds, affecting all the pelvic I am acquainted with two cases of oblique contraction from vertical f of one os innominatum. One of these pelves is in the Dresden coll here the right os innominatum was fractured almost vertically from tl to the tuber ischii, and had healed with dislocation of the anterior the inside. The second pelvis was presented to our collection in Mu Prof. Bollinger. Apart from the fracture (*vide* Fig. 109), it is also n by the resulting exostosis, and the right half of the pelvis is bent in osteomalacic pelvis; the patient committed suicide in the fourth m pregnancy. Otherwise, exostoses appear to be associated most frequently with general contraction of the pelvis (*Neuerzeit, Stadfeldt*).

Finally, the pelvic spaces may be rendered impassable by new formations of bone (Fig. 108). The obstructions to labor which have been observed, are: 9 cases of osteoma, starting six times from the sacrum, and 29 cases of osteosteatoma, including 17 fibromata, 5 enchondromata, 7 sarcomata or carcinomata. When the tumor starts from the anterior pelvic bones, it is, as a rule, either an enchondroma or carcinoma; starting from the posterior wall, all forms occur with equal frequency.

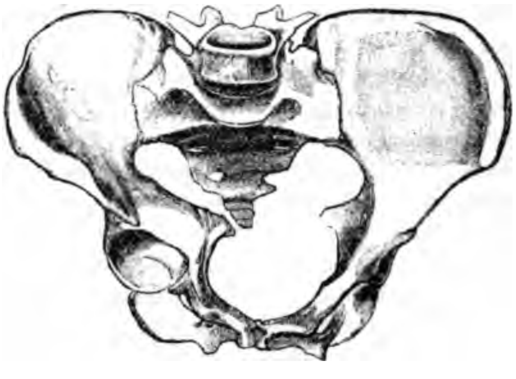
FIG. 108.



The same pelvis, seen from above. Osteoma of the right os innominatum.

X. The fissured pelvis, pelvis inversa or fissa, as an obstruction to labor, was made known in 1722 by Bonnet. Since then other cases have been observed by Ayres, Freund, Litzmann, Ginsberger and Gusserow (*vide Stubenrauch*). Its origin is the same as that of ectopia of the urinary bladder. In the adult the pubic bones are separated 7 — 11 cm. (14.9 (?) *Freund*). Their union by a special ligament may be wanting, as is proved by Litzmann's case. The anterior surfaces of the pubic bones are turned more to the outside than to the front. The sacrum is narrow and long, the sacro-iliac articulations are occasionally synostosed (*Freund*), but not always (*Litzmann* and *Gusserow*). Despite the great transverse stretching of the pelvis, the transverse diameter of the pelvic inlet is not larger, but, according to Litzmann's calculations, even smaller than normal. The difference

FIG. 109.



Pelvis displaced obliquely by vertical fracture of the ilium, with exostosis. Munich collection.

between the distance of the anterior superior spinous processes from one another and that of the crests of the ilia is diminished, and hence the fissured pelvis appears more like the rachitic pelvis. A characteristic feature is the position of the lower limbs. The thighs do not touch one another, even when the knees are brought into contact, and remain at a considerable distance from one another in the upper third. As a rule, delivery in such cases requires artificial aid. Inasmuch as the unsupported uterus is apt to come down and prolapse, spontaneous premature delivery has occurred repeatedly (cases of *Litzmann* and *Gusserow*).

In conclusion, we must not fail to mention that the pelvic outlet may be narrowed by luxation and ankylosis of the coccyx, with fixation of its tip anteriorly, and that an obstruction to labor may be the result of this anomaly.

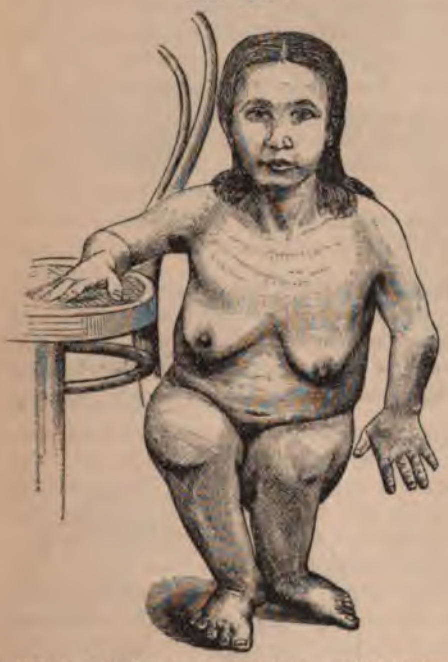
Etiology.—The causes of pelvic deformities may be divided into those which result from a constitutional disease and those which are of local origin. Among the latter we have already mentioned affections of the hip joint, synostoses of the sacro-iliac synchondroses, fractures and neoplasms, as well as exostoses of the pelvic bones. It only remains for us to consider the constitutional causes. Of these there are, in the main, two, viz., rachitis and osteomalacia.

Rhachitis (*ῥαχιτης*, wrongly written without an *h* by Glisson) is a disease of the epiphyses of the long and flat bones during fœtal life (Fig. 110) or in the first years of childhood; in this affection the development of cartilage cells is remarkably active, while the deposit of lime salts, and thus ossification, occurs imperfectly, in islets, or the lime salts deposited in the ossified parts may again diminish as the result of pressure. The bones harden much later than healthy bones and, after complete ossification, may be very thick and round, or they may be only moderately large and even very atrophic. According to the investigations of Kassowitz (*Jahrb. f. Kinderheilk.*, N. F., XIX, S. 430, 1883; *Wien. Med. Blätter*, 1883, Nos. 50, 52; 1884, Nos. 1–6), the nature of rickets consists in the abnormally increased, dilated and distended blood-vessels which spread through the bone-forming tissues, the cartilage, perichondrium, periosteum and the bones themselves; by their morbidly increased circulation of plasma (?) they prevent the deposit of lime salts in the cartilage and the new-formed osseous layers, and produce increased breaking down of the cartilage and bone. Experiments with phosphorus, whose condensing action, in minute doses, upon the blood-vessels of the osteogenous layer was proven by Wegner, taught Kassowitz that an increase of the dose of phosphorus in animals produced the appearances of rachitis, and that phosphorus, like the syphilitic virus, gives rise to an inflammatory process which, when moderate in severity, exhibits a great analogy to rachitic changes and, in its more marked development, even to the severer syphilitic changes, in these tissues. On the other hand, smaller doses (ol.

morrhuæ 100.0, phosphori 0.01, one teaspoonful daily, or ol. amygd. dulc. 70.0, phosphori 0.01, pulv. sacch. alb. 30.0, æth. frag. gtt. xx, one teaspoonful daily, or ol. amygd. 30.0, phosphori 0.01, pulv. acaciæ, sacch. alb. āā 15.0, aq. destil. 40.0, one tablespoonful daily) produced very favorable results in rachitic children.

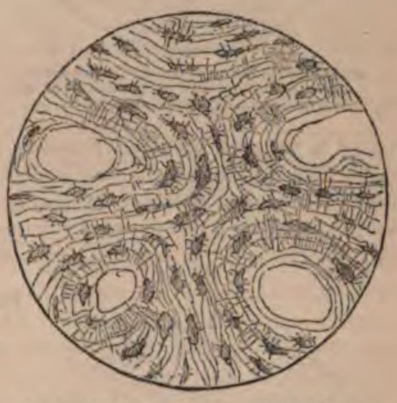
Softening of the bones, osteomalacia, halisteresis ossium (*Kilian*), also called rickets of adults, is, on the other hand, a disease of the adult female, particularly of those who have already borne several children, usually easily and rapidly. It consists anatomically of an ostitis and periostitis, in which, from some still obscure cause, the perfectly hard bones (Fig. 111) are decalcified and are replaced at first by lamellar connective tissue; finally, this passes centrally into the round granular medullary cell. The medullary spaces and Haversian canals grow larger, the bone corpuscles in part disappear, in part they become shorter and their process smaller (*vide* Figs. 112 and 113). The decalcified parts can often be impregnated with colored fluids. The more complete the substitution of connective tissue, the more flexible the bones become. In osteomalacia cerea they are almost as yielding as wax, and are soft enough to be cut.

FIG. 110.



Patient with fœtal rachitis, delivered artificially by Prof. Pippingskjoeld, of Helsingfors.

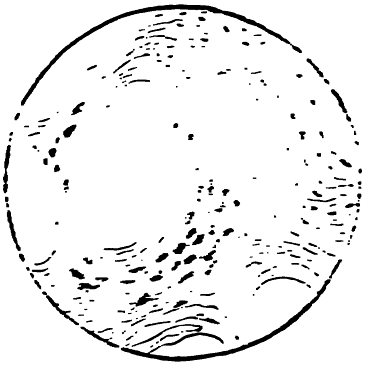
FIG. 111.



Section of bone from the normal pelvic bones.

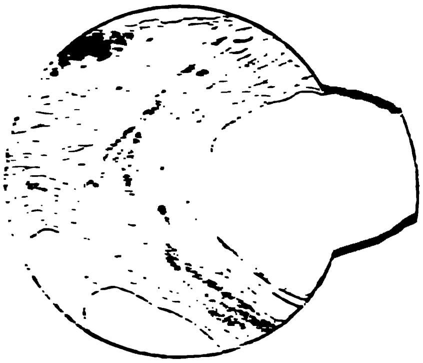
According to Kassowitz the difference between osteomalacia and rickets consists in the fact that in the latter the normally disturbed processes in the interior of the older portions of bone are prominent in the apposition of new parts on the part of the cartilage and periosteum, while these normal disturbances of apposition are absent in osteomalacia, because apposition has

FIG. 112.



All grades of degeneration of the bone corpuscles. Dilatation and malformation of the Haversian canals. Rim of the pelvis.

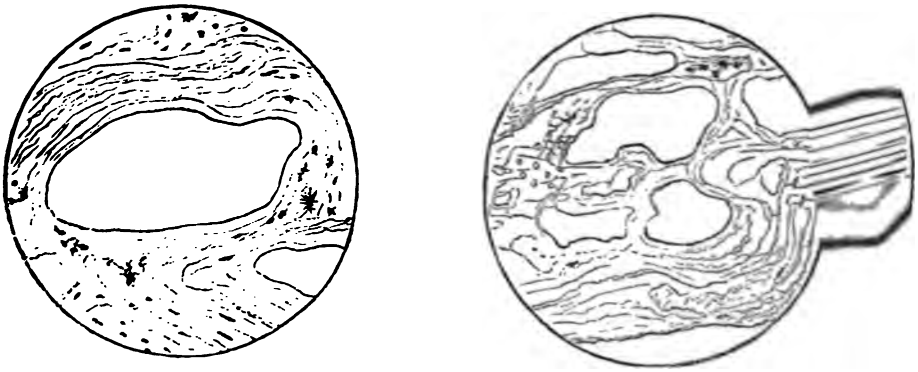
FIG. 113.



Inner part of the pelvis.

ceased in the adult skeleton. Kassowitz, therefore, maintains that the erection of a non-rachitic infantile osteomalacia is not justified. Osteomalacia also occurs in women who ad been rachitic during childhood. It may be recovered from in the child-bearing period, nd the pelvis may again become completely ossified (the only example is the case described by me, vide Fig. 101). It may also persist, although the women no longer become pregn nt

FIG. 114.



Almost complete decalcification.

and acquire better surroundings; finally, the pelvis may become so compressible on all sides that micturition and defecation are hardly possible, and the marasmus finally leads to a fatal termination (example shown in Figs. 102 and 103).

As regards the geographical distribution of puerperal osteomalacia, we begin with Germany. In Bavaria 23 certain cases of osteomalacia, including 2 men, have been hitherto reported.

Of these 23 cases, 6 occurred in Lower Franconia, 5 each in Upper Bavaria and Middle Franconia, 2 each in Lower Bavaria and the Rhine Palatinate, 1 each in Suabian Neuburg, Upper Palatinate and Upper Franconia. It is very noteworthy that the greatest number of these cases were observed in the University towns, Erlangen (4), Munich (5), Würzburg (4), and only single cases in Augsburg, Landau, Donauwoerth, Freckenhausen, etc. As its occurrence has been noted in all parts of the kingdom, its varying frequency and the apparently striking numbers in and around the University towns depend probably upon the diagnosis. Perhaps various cases in other parts of the kingdom are unrecognized, as is also true of those occurring in the three University towns.

Dr. Hörner of Bergzabern (I. D., Munich, 1886), also called attention to the fact that Prof. von D'Outrepont, in Würzburg, possessed in his collection fourteen osteomalacic pelves of very pronounced shape, and various others in which the osteomalacic deformity was only beginning. But as there are no clinical histories of these preparations, it could not be determined with certainty whether and how many of these came from Bavaria; only one case of Cæsarean section, which D'Outrepont performed upon an osteomalacic individual, and which terminated fatally, certainly belongs here. As the disease occurs in all parts of Bavaria, it must remain a very striking fact, in view of the small number of published cases, that one-sixth of them occurred in the practice of a single Würzburg physician.

This also holds good with regard to Würtemberg. The number of known cases is smaller than in Bavaria, but in 1880–84 six cases of this kind were observed in Tübingen, at Liebermeister's Clinic, alone, and Dr. Piesberger properly states, in publishing the cases, that the disease undoubtedly occurs more frequently than is supposed, but is not always diagnosed.

Indeed there are few districts in Germany in which it has not been found, and the immunity claimed by Cohnheim for the banks of the Oder has been recently disproved by two cases observed by Kroner in Breslau.

If we leave Germany for the present and pass to the north and south of Europe in order to ascertain how far the disease extends, we will find that the most northern point is Christiania, from which two cases have been recently reported; the most eastern point is Kiew, in which two observations have also been made; the most western point Dublin; the most southern point is Naples. Observations of this kind have also been published in America, in Philadelphia and New York. In some countries in which there are numerous cases, for example, England, we find more or less numerous observations of this kind reported from all parts, such as Dundee, Edinburgh, Manchester, Blakeburne, Leicester, Norfolk and London. This is also true of Switzerland, in which various cases have been observed in Berne, Basle, Zurich, and of Italy, in which they have been reported from Turin, Milan, Pavia, Parma, Bologna, Florence and Naples. In view of the differences between these countries as regards climate, character of the soil, food and social conditions, it will surely not be going too far to maintain that the conditions under which osteomalacia develops occur everywhere, and that they are surely not dependent on special conditions of the soil. If we find it with special frequency in individual places and entire districts—as has been found with regard to the Rhine between Mayence and Wesel, and between Aix-la-Chapelle and Marburg, where at least one-third of all hitherto known cases have occurred, and where the author himself has examined fourteen living women suffering from this disease—and if a single physician of Sottegem, in East Flanders, has been compelled to perform Cæsarean section eleven times on account of osteomalacia, then we are only permitted to draw the conclusion that in some regions the various hitherto known causes must be present with special frequency. Indeed, this can be quite easily proven with regard to such regions.

If we arrange the seven different causes of this disease according to their action in time we must begin with the influence of damp, cold, draughty dwellings. These, together with poor, insufficient clothing, explain the beginning with rheumatic pains in the lower limbs and back. Next follows poor diet, in which chiefly potatoes, sour bread, *i. e.*, food which is poor in lime, rich in potash and magnesia, aid in the production of gastric and intestinal catarrh. Next comes another pregnancy, in which partly the increased hyperæmia of the skin, partly the ever-present digestive disturbances, partly the abundant transmission of lime to the foetus make the blood and tissues of the pregnant woman still poorer in lime. With these are associated as further factors the processes of labor and the puerperal state, which must still further diminish the resistance of the organism by the increasing muscular strain, the losses of fluids, the pains and the prolonged stay in bed. It is particularly lactation, especially when protracted, to which a very injurious influence must be ascribed. Finally, if hard labor in the fields, prolonged stay in cold booths, grave cares and worry of the most different kinds are superadded, is it astonishing that even the most vigorous organism must finally succumb? The fact that puerperal processes play an especially important part in etiology is best made evident from the facts that non-puerperal osteomalacia in women is extremely rare, and that, while all the other causes are not infrequently found combined in males, the occurrence in them of true rheumatic osteomalacia is remarkably rare. The combinations of these seven causes may be manifold, but the most frequent, according to my observations, is the association of rheumatic with digestive disturbances and puerperal processes. In the previously mentioned district on the Rhine these are united in a manner which is, perhaps, never observed elsewhere. In the mountainous communities the laborers live scattered in damp mud huts; their sleeping places are very often alcoves in the living-room, dining-room and kitchen—dark holes in which the vapors coming from the latter are precipitated on the cold walls; the bed clothes are apt to become mouldy, are always damp. In the spring the husband goes to town for work, only returns at the end of months and often is unable to send any money; the wife not only cares for the household, but ploughs the field and plants potatoes, from which alone she lives, in addition to coffee, *i. e.*, chicory, and sour rye bread. Milk is not to be had in such huts, at the most a little brandy. At the same time the woman nurses her child, despite her labor and cares, for one or two years, or even longer, because in the first place she has no other nourishment for the child and, in addition, hopes that during lactation she will not become pregnant so quickly. But very many women are deceived in this hope, and some feel the movements of the next child before they can make up their minds to wean the previous one.

In 1853 Dr. Hoebecke, of Sottegem, in East Flanders, described exactly the same causes which necessitated Cæsarean section eleven times in that region on account of osteomalacia.

If further proof were necessary that these causes alone are responsible for the development of osteomalacia, it would be furnished by the fact that the disease, so long as it has not attained too great a development, can be relieved by the removal of these causes. Indeed [illegible] reossification of the softened parts may be brought about (*vide* Fig. 101). Even in advanced cases a standstill and prolonged improvement may be effected, as can be seen from the diminution of the pains and the greater facility of movement. And thus in these regions my father has succeeded in making the disease less frequent by the removal of the alcohol [illegible] the care of the sick on the part of the community, by procuring better food, by forbidding excessive lactation, etc. Hence difficult labors have become less frequent in that region, [illegible] the number of those slightly affected also appear to have diminished. Nevertheless there [illegible] enough cases in which, despite all improvements and the removal of the causes, the disease continues for years and decades. Mrs. Haarhaus' pelvis, which I have depicted in Figs. 102 and 103, comes from such a patient who, despite the good surroundings into which [illegible] had entered, did not recover from the osteomalacia. It is these very cases which constantly compel us to assume that the diminished supply or increased expenditure of lime does not suffice for the explanation, but that chronic inflammatory processes in the bones materially impair the normal growth, that the disease is really part of a rheumatic affection. This would be in accordance with the frequent occurrence of muscular atrophy, often general, but found especially in the ball of the thumb and the intercostal muscles. In the higher grades, as a matter of course, the muscular changes are the result of their traction, disuse, imperfect nutrition and compression.

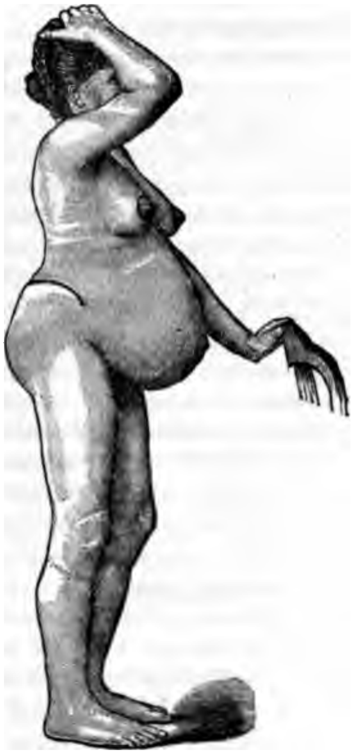
Definite cocci or bacilli have not been demonstrated hitherto, but have long been suspected (*Zuern*). Cohnheim—who thought that osteomalacia, apart from a perhaps increased absorption of the bone salts by the hyperæmic medulla of the bones, consisted in the apposition of osseous basement substance without earthy salts, *i.e.*, of osteoid bone—regarded the assumption that this could result from an abnormal amount of lactic acid in the blood as false. Apart from the fact that the feeding of lactic acid (7.4 gm. daily) to a little dog, continued for 308 days by Heiss in von Voit's laboratory, had positive results, Cohnheim regarded the theory as wrong, because such a decalcification would presuppose a very acid condition of the blood, and this is incompatible with our present knowledge of the properties of the blood. But, as Prof. Siedamgrotzky ("Verh. d. Ges. f. Natur- und Heilkunde," Dresden, 1878–79, p. 41) has shown, herbivora differ in this respect. By feeding goats with lactic acid (about 5 gm. daily, 638.5 gm. in 147 days), he succeeded in diminishing the specific gravity of all the bones and also their mineral and organic constituents, so that they became softer, the Haversian canals wider, and the water and fat more abundant. The flat bones were more, the long bones were less affected. We must therefore imagine that the lactic acid—sulphuric and hydrochloric acids had no effect of this kind upon the animals—inasmuch as it is supposed to exercise no effect upon the digestibility of the organic and mineral substances, may decalcify still more the food of herbivora, already poor in lime, and may increase, for example, the discharge of lime through the fæces in such a way that the food becomes too poor in lime to generate normal lime-containing osseous tissue from the medulla. As far as regards diet, the majority of osteomalacic women resemble the herbivora very closely, and, at all events, digestive disturbances, which interfere with the reception of sufficient amounts of lime by the blood, play one of the most important parts, in addition to a diet poor in lime, in the majority of cases of this kind. The admirable investigations of Prof. Rud. Jacksch, of Graz, on the alkalescence of the blood in disease (*Zeitschr. f. Klin. Medicin*, XIII, Heft 3–4), which have also proven diminished alkalinity of the blood in osteomalacia, open a new path in the knowledge of this disease. In the case mentioned, he found the alkalinity diminished from 250 to 80, and in a patient, at present under our treatment, it is even reduced to 32. There is no reason whatever for assuming the presence of affections of the brain or spinal cord as causes of the muscular atrophy and fibrillary twitchings which occur in osteomalacia. Despite the persistence of such conditions for years, despite great atrophy of the muscles, their electro-muscular, faradic and galvanic excitability is not only not enfeebled, but is normal or even increased.

The best empirical remedies against the disease have been found to be: cod-liver oil, which is intended to facilitate the absorption of the fats by its biliary contents; also iron in large amounts, especially as albuminate of iron, and lime water with tea or carbonate and phosphate of lime.

Wholesome habitations, good clothing, generous diet, not too frequent pregnancies, not protracted nursing and avoidance of hard labor are indispensable for the prevention of the disease.

Symptoms in Pregnant and Parturient Women with Contracted Pelves.—1. *General Symptoms.*—Even in the first months of pregnancy a contracted pelvis may exert an injurious influence on the genitalia, inasmuch as the fundus uteri will be pushed beneath the promontory, and there retained in case the bladder is full or the uterus is already retroverted. Among thr hundred cases of pelvic narrowing, I have seen this result only once, b Litzmann has observed it in several su cessive pregnancies in a rachitic multipa with generally contracted flat pelvis.

FIG. 115.



Flat rachitic pelvis of the second degree. Pendulous abdomen, despite firm abdominal walls.

In the last months of pregnancy, u usually great mobility of the uterus an particularly the very frequent occurren of a pendulous abdomen, especially in i higher grades, are noticeable as the r sults of narrowing of the pelvis (Fig. 115 It is found most frequently when the al dominal walls are flaccid and yieldin *i. e.*, more often in multiparæ and tho who have borne many children than i primiparæ or those who have borne a fe children. Nevertheless, it may remai absent after repeated pregnancies, despi narrowing of the pelvis. Changes in th shape of the uterus, particularly the broa and oblique form, often occur in co tracted pelves, while the spherical sha is more apt to be found in wide pelve The former is often merely secondary t faulty position and presentation of th fœtus; for, according to Litzmann, ve tex presentations are 10 per cent. le frequent in contracted pelves than no mal; prolapse of the funis and extrem ties is 4–6 times more frequent; fac shoulder and breech presentations a 2–3 times more frequent. Among 300 contracted pelves I found 90.6 p cent. vertex presentations, 2 per cent. brow presentations, 3.4 per cen face presentations, 2.6 per cent. breech presentations and 1.6 per cen oblique positions.

So far as regards labor pains in contracted pelves, Michaelis entertaine the opinion that abnormal pains occurred more frequently in narrow than i wide pelves, and that they are usually produced indirectly by the narrowin Litzmann, on the other hand, found disturbances of the pains not unusuall frequent in narrowing of the pelvis, and thinks that they depend only on th condition of development and nutrition of the muscular and nervous app ratus of the uterus, but not upon a single mechanical factor. Neverthele he acknowledges that local circulatory disturbances produce changes in th tissues of the organ which enfeeble the vigor of the contractions. In the uniformly contracted pelvis he found feeble, and particularly in primiparæ, spasmodic pains more often in the first stage than in others; in the flat pelvis he did not notice any unusual intensification of the pains, but found them very violent in a generally contracted and an osteomalacic pelvis. It is evident that in narrowing of the pelvis, the pains are influenced by very different factors; high position of the head, impaction of the wall of the uterus, premature escape of the waters, long continued and frequent examinations, faulty position and presentation of the child, and abnormal position and shape of the uterus, are the most important. In multiparæ, moreover, these factors are supplemented by the changes in the vaginal fornix and the cervix uteri, acquired as the result of former deliveries.

On the average, the duration of labor is almost half as long again as when the pelvis is wide. The part played in primiparæ, in this regard, by the greater resistance of the soft parts, is effected in multiparæ by the relaxation of the uterus, the greater development of the child and its frequent faulty position and presentation. According to Litzmann's and my experience the engagement of the head before parturition is the rule (7 : 10), in primiparæ and multiparæ, while this occurs in narrowing of the pelvis only in 8 per cent., partly before parturition, furthermore only in 24 per cent. before the rupture of the bag of waters, and in 56 per cent. only after the os uteri is completely open.

Another noticeable feature is the condition of the amniotic sac. When the cervix is yielding, the sac projects like a hemisphere; when the cervix presents greater resistance, it is more cylindrical, and when the resistance is greater at the internal os, it is more constricted and associated with folding of the membranes. At the same time the rupture of the bag is not very pronounced (*vide* p. 339: 28 : 42 per cent.), more often occurs too early, and when this happens it is premature rather than early. This may result partly from irregular traction on the membranes, partly from the excessive pressure exerted upon the tip of the sac by the greater amount of fluid.

If rupture of the bag occurs early when there is considerable obstruction, the pressure of the rim of the pelvis against the head forms a considerable cephalhæmatoma. This distends the flabby pendulous cervix uteri, the body of the uterus gradually withdraws above the fœtus, while the head remains in situ, the muscular wall or ring of contraction, which can be palpated above the symphysis, moves further and further upward, nearly to the level of the umbilicus, and the lower segment of the uterus is distended to such an extent by the parts of the child which have been forced into it, that it ruptures at the most tense parts, or those which have been thinned and made brittle by compression. The rupture may also begin in one lip or in the vaginal fornix. Such ruptures occur in 2 per cent. of all contracted pelves. They begin from within. With the displacement of the head the vessels of the uterine walls are eroded, subperitoneal, more or less large hæmatomata develop, until finally the peritoneum yields and the hemorrhage takes place free into the abdominal cavity, unless the rupture is tamponed by emerging parts of the child. Even in footling delivery, in contracted pelvis, it may happen that, after extraction of the trunk, the body of the uterus is retracted completely over the head, which is still retained at the pelvic inlet.

Moreover, the soft parts of the mother ordinarily suffer considerable pressure in narrowing of the pelvis, and this first produces venous stasis, then œdema, then small hemorrhages, and finally necrosis or perforation. The points of greatest pressure correspond to the promontory and the narrowed parts of the anterior pelvic wall. Hence they are found mainly in the supravaginal portion of the cervix, and in addition the anterior and posterior walls of the bladder in the corresponding parts show exactly similar pressure necroses.

Contusions against the rami of the pubes, which appear in the vagina and near the pelvic outlet, are much rarer. In very rare cases even the pelvic articulations are separated, and mere traction upon them often produces inflammatory processes. Litzmann observed the same thing in the sacro-coccygeal joint in a case of contracted pelvis. As regards deviations from the ordinary mechanism of labor, we refer in part to the remarks already made on anterior vertex, brow and face presentations (page 396), in part to the description of these anomalies in the special part, where the different pressure marks that arise during the passage through the contracted pelvis will also be considered.

Special Symptoms.—If, after discussing these general results of narrowing of the pelvis, we now enter in greater detail into the characteristic symptoms of the most frequent forms, it is to be remarked: 1. Concerning the uniformly contracted pelvis (whose narrowing very rarely falls below 9 cm. for the conjugate and probably never under 8 cm.), that changes in the shape and position of the uterus (pendulous abdomen) are found less frequently than, on the average, in other forms of narrow pelvis; hence vertex presentations predominate and, at the most, footling presentations are also found. Furthermore, in shortening by 1.5 cm. and even 2 cm. in all diameters, not more than the ordinary obstructions appear when the head precedes or follows. A characteristic feature, first emphasized by Mampe (1821), is the deep presentation of the small fontanelle; hence the straight axis of the head approaches the pelvic axis. Another characteristic feature is the changeability in the direction of the sub-occipito-frontal diameter to the diameters of the pelvic inlet. Screw-like rotations can be recognized, partly around the vertical, partly around the sagittal diameter, so that sometimes the parietal bone situated anteriorly is lower, sometimes that situated posteriorly, and even a vertical plane passing through the sagittal suture may be forced through the pelvis in a direction corresponding almost exactly to the conjugate.

Finally, in a transverse position of the head, the more uniform entrance of both parietal bones into the pelvis is peculiar to the general uniformly contracted pelvis as compared with the flat forms of the pelvis. Michaelis and Litzmann were agreed that, in the slighter pelvic contractions of this kind the head enters the inlet with depressed chin more readily than in flat pelves, and can be rotated more easily. According to Litzmann's opinion ruptures of the uterus and vagina occur very rarely in the uniformly contracted pelvis. He found only one case of this kind in literature, and explains the rarity by the theory that the earlier relaxation of the activity of the labor pains in this form of pelvis, under otherwise favorable circumstances, does not permit extreme retraction of the body of the uterus. This view has much in its favor. But in this form of pelvis, according to Roederer's statement, a true paragomphosis, an impaction, occurs in such a way that the head and pelvis seem to have coalesced into one body; and as we so often find, in this form, swelling of the lower segment of the uterus, the vagina and vulva, violent pains, formication and lameness of the thighs and inability to evacuate the bladder, the injury to the uterus is produced rather by the intense pressure and friction. I have observed a very characteristic case of this kind, in which the lower uterine segment was rubbed through almost in a circle; the true conjugate was 8.5 cm., the dimensions of the child 3.5 kg. and 50 cm. (*vide* "Pathologie des Wochenbettes," Clinical History, No. 7, p. 105).

As a rule, the caput succedaneum attains considerable dimensions and extends over the entire presenting part of the child. Circumscribed points of compression on the scalp are rarer, because the pressure is rather general; yet pressure necroses do occur at times. When the occiput is low, the pressure of the promontory affects the frontal bone, which is situated posteriorly, and appears as a pressure streak or several pressure spots or sugillations parallel to the frontal suture. In almost half of all cases there is displacement of the cranial bones in the sutures, the occipital and frontal bones being pushed beneath the parietal bones. Lateral displacement of both halves of the cranium against one another is very rare, and there is never a funnel-shaped depression of the skull. The danger to the mother consists in the contusion of the soft parts and subsequent inflammation (6.8 per cent. mortality). According to Litzmann, the mortality of the children is only 9.5 per cent. (as contrasted with 20.5 per cent. in narrow pelves in general), on account of the frequent vertex presentation, the favorable engagement of the head, and, therefore, partial retention of the amniotic fluid, despite premature rupture of the membranes.

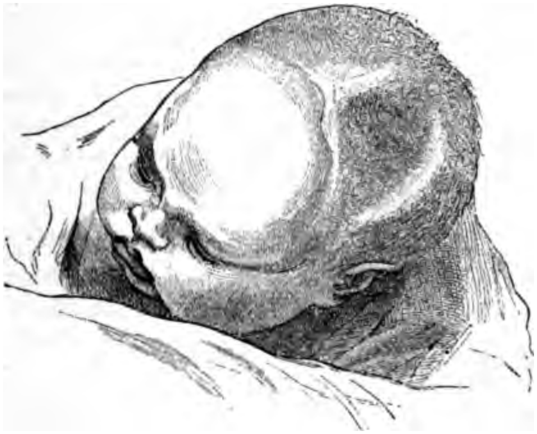
2. In simple flat pelves, rachitic and non-rachitic, the conjugata vera very rarely falls below 8 cm. In them, pendulous abdomen, oblique positions, prolapse of small parts and of the funis are most frequent. The greatest obstruction is situated at the pelvic inlet; the entrance of the head usually, there-

fore, occurs at a late period only after complete dilatation of the os uteri, in almost half the cases. The entire duration of labor and of each individual stage is longer than in the uniformly contracted pelvis, partly because the head is so often above the pelvis at the end of the stage of dilatation, partly because exhaustion of the labor pains occurs more often. As regards the mechanism of labor, the engagement of the head with its sagittal diameter in the transverse diameter of the pelvic inlet is the rule. A characteristic feature is the long continuance in this position, in which it may even be entirely expelled. It is only exceptionally in such cases that the occiput is lower; as a rule, the large fontanelle is lower than usual and found near the median line. Pressure marks of the promontory along the coronal suture down toward the temple or cheek show that this low position of the anterior part of the vertex results from rotation around the transverse axis, which is placed firmly in the conjugate. As a general thing, the parietal bone, which is situated posteriorly, remains above the promontory, the sagittal suture approaches the latter more and more, and there develops a so-called anterior parietal bone presentation (*Litzmann*). In much rarer cases, on the other hand, the parietal bone situated posteriorly descends much lower (posterior parietal bone presentation). A transition occurs occasionally in one and the same labor from one parietal position to the other. The shape of the uterus, the direction of the uterine and fœtal axes, which do not depend solely upon the mechanical conditions of the pelvis, are the main factors by which a posterior parietal bone presentation develops in contracted and wide pelves. As a rule, the pains, in addition to pressure upon the head from the outside and raising the body of the parturient woman, will effect the descent of the parietal bone, which is pushed up anteriorly.

In the passage of the child in presentations of the pelvic extremity a transverse position of the head is constant. The chin descends, or the occiput and chin are at the same level, or exceptionally the occiput passes first into the pelvis alongside the promontory, while the chin remains fixed over the symphysis. In the maternal soft parts the results of pressure correspond to the promontory and upper edge of the symphysis; necrosis and erosion may be the result. The caput succedaneum is rarely very extensive; circumscribed pressure spots are the rule. But there may also be pressure lines from the temple across the frontal bone toward the outer angle of the eye, and several round pressure spots alongside the large fontanelle, upon the frontal and parietal bones, connected by a red streak parallel with the sagittal suture. In rare cases there is also a pressure mark produced by the anterior pelvic wall. The displacement of the cranial bones at the sutures is present in only one-third of the cases, but that of the two halves of the cranium upon one another is five times as frequent as in the uniformly contracted pelvis. The posterior parietal bone is usually flattened; the bones are very often pressed by the posterior pelvic wall into the shape of a groove or funnel (Fig. 116). These impressions are rarely produced by the anterior pelvic wall. The *prognosis* is somewhat more unfavorable for the mother than in the uniformly contracted pelvis; the mortality is 7.7 : 6.08 per cent., as the result of accidental complications, not of the greater diminution of space. As the result of the longer duration of labor and the greater frequency of faulty positions and presentations, the prognosis as regards the life of the child is much more unfavorable; 60 per cent. of the children are stillborn.

3. In the generally contracted flat pelvis, which owes its origin usually to rickets, the shape of the pelvic inlet is triangular; pendulous abdomen and faulty position and presentation of the fœtus are here most frequent. At the beginning of labor the presenting head is almost always entirely above the lesser pelvis; the duration of labor, particularly of the second stage, is considerably greater than in the simple flat pelvis. It is only when the obstruction at the pelvic inlet is overcome that, on account of the usually considerable divergence of the pelvic walls below, the escape of the head from the pelvis, under otherwise favorable circumstances, may occur with surprising rapidity (*Litzmann*). The presenting cranium almost always enters the transverse diameter of the pelvic inlet in the sub-occipito-bregmatic diameter, very rarely in an oblique diameter, still more rarely in the conjugate. Litzmann observed the latter in one case. The occiput almost always enters first, but there is a prolonged oscillation between occipital and anterior vertex presentation. The latter is by far the more unfavorable. In a few cases Litzmann observed the entrance of the head in such a way that a rotation forward occurred around the anterior upper angle of the parietal bone, which

FIG. 116.



Funnel-shaped impression of the anterior half of the left parietal bone by the promontory. Displacement of the right half of the cranium backward (summer of 1882, Schubert). Displacement of the frontal bone beneath the parietal bone, and the right parietal bone beneath the left.

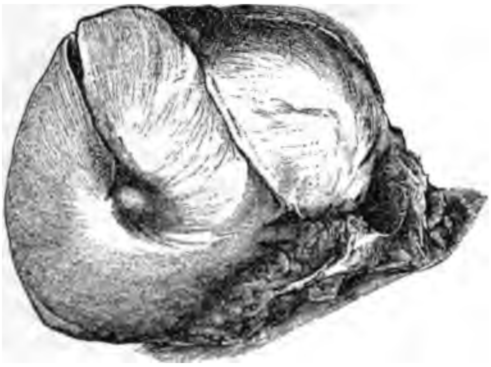
was situated posteriorly, and which had become fixed upon the promont and that the occiput, in passing down, was directed toward the fora ovale. Both parietal bones rarely engage in a uniform manner. An a rior parietal presentation occurs most frequently; a posterior parietal sentation in about one-fifth the cases. A change from one to the other occurs, which may be favored by considerable amniotic fluid, and the la percentage of multiparæ with flabby uterine walls. Delayed rotation aro the vertical diameter of the cranium, exit of the cranium in an obliqu even transverse position, also occur.

In presentations of the pelvic extremity the cranium usually emerges depressed chin; when the forehead and occiput are at the same level, obstruction is very great; in oblique positions of the head it is less marl The frontal bone, situated posteriorly, experiences more or less deep shaped or funnel-like impressions; depression of the parietal bone situ anteriorly at the squamous suture is more frequent in oblique than in tr verse positions. The head may enter the pelvis with the occiput in adva

On account of the great force and duration of the pressure, dange contusions and ruptures are more frequent in the fornix, lips and cervix, frequent in the supra-vaginal portion from within outward as far as the pe neum. They may also take place from without inward (*Litzmann*, Obse tion 73).

The caput succedaneum is usually situated upon the lesser fontanelle, a very often large. Circumscribed pressure spots are most frequent and la than in other forms of pe and are usually situated in region of one prominenc near the large fontanelle. displacement of the bon the sutures is also more quent and pronounced common; the parietal b situated posteriorly, is us shoved beneath the ant one, the occipital bone neath the parietal bones, at the same time, one-ha the cranium, *i. e.*, the ante is pushed backward (Fig. 1 The parietal bone situ posteriorly is flattened. Funnel-shaped or cup-shaped impressions, mad the promontory, are much more frequent than in the simple flat pel fractures of the bones may occur at the same time (Fig. 117). The tality of the mothers in childbed is greater than in simple flat pelvis (8.3

FIG. 117.



Fissure of the right parietal bone, running vertically from the parietal prominence to the sagittal suture, the anterior end pushed beneath the posterior.

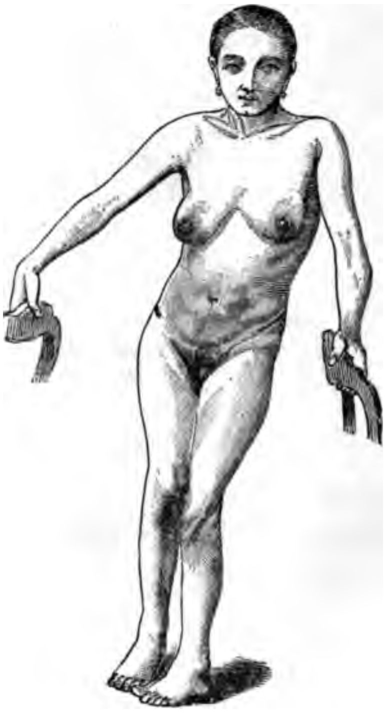
cent. : 7.07 per cent.) as the result of the more severe injuries during delivery. The prognosis for the child is the most grave; 66 per cent. succumb, owing partly to the abnormally long labor, partly to the often very early rupture of the bag when the head is high and immovable, partly to faulty positions and other complications, partly to the cerebral hemorrhages, cranial depressions and fractures of the bones acquired during labor.

4. According to the statistics of Litzmann, the course of labor in obliquely contracted pelves is strikingly unfavorable. Among 28 mothers 22 succumbed to the first labor, and of 41 children only 10 were born alive. But, as Spiegelberg aptly remarks, these sad results express only the effects produced by high grades of narrowing and displacement, and they are undoubtedly much better in the slighter grades. The latter are rarely published. In 1882 I published a very interesting case of asymmetry of the pelvis as the result of congenital paresis of the right side and luxation of the head of the right femur. The right oblique diameter of the pelvis major was 3.5 cm. smaller than the left, the size of the corresponding oblique diameter at the pelvic inlet was estimated at 9 cm., the left sacro-pectineal distance at 7 cm., and, nevertheless, the head entered the unfavorable half of the pelvis in the first vertex position, and a living child (49 cm., 3130 gm.) was delivered with forceps.

5. The results of parturition in the lumbo-sacral-kyphotic pelvis which were collated by N. Phaenomenoff and which I have supplemented by several cases, are such that of 21 women 14, or 66 per cent., and of the children 75 per cent. succumbed.

6. In the majority of hitherto observed cases of spondyl-olisthesis Cæsarean section was performed, but the more the number of these pelvic anomalies increases—*i, e.*, the more often the milder cases are also recognized, the more their prognosis will improve. In my two cases full-term children were delivered alive through the pelvis, both with the aid of art, but easily (*vide* Figs. 119 and 122).

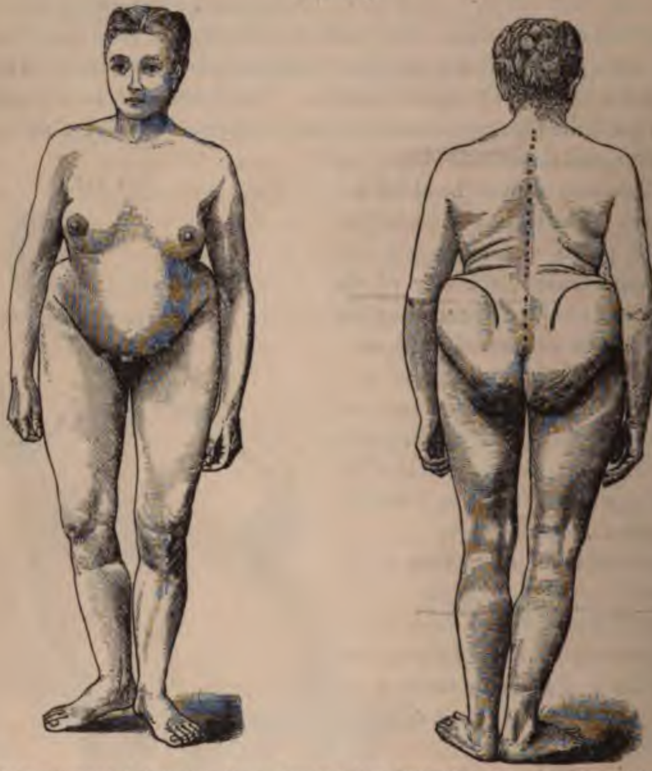
FIG. 118.



Hemiplegia and luxation of the right femur outward and upward. Shortening of the right oblique diameter in the entire pelvis minor ("Klin. Beobacht. z. Dystokie," p. 30).

7. In the osteomalacic pelvis the narrowing, when considerable, gives rise to all the previously mentioned anomalies — the development of cephalhæmatoma, early escape of the waters, prolonged position of the head high up, enormously pendulous abdomen, contusions of the soft parts—in increased measure with the subsequent births. But there are cases in which these anomalies appear very suddenly after a short duration of the disease, others in which, even after long standing of the affection, difficult but spontaneous deliveries occur several times in succession, and finally, those in which, despite the highest grades of narrowing of the pelvis from osteomalacia, the expulsion of the fœtus is accomplished by the natural powers, or with slight artificial assistance, on account of the rubber-like yielding character of the pelvic walls (*Breslau* and the author).

FIG. 119.

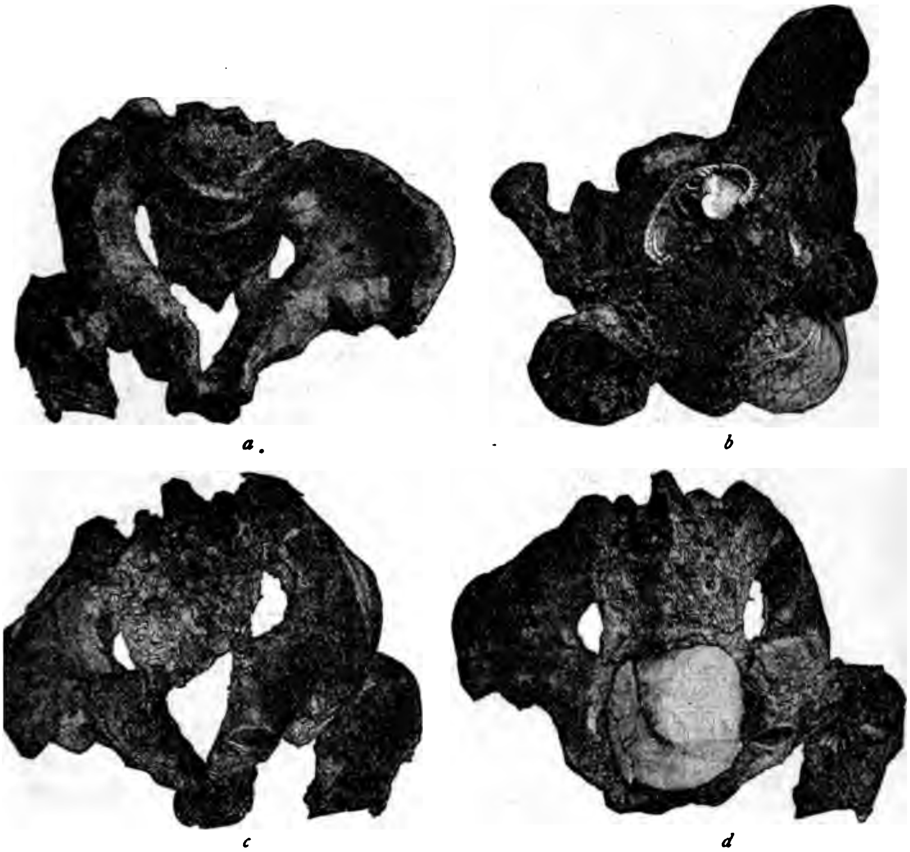


Mrs. H. Moderate spondyl-olisthesis. Description in "Klin. Beobacht. z. Dystokie," von F. Winckel, p. 37. Forceps—living boy of 51 cm., 3750 gm.

In Fig. 120 (*a*, *b*, *c*, *d*) is represented such a rubber pelvis, from a Mrs. Dickhaus (described in the *Monatsschrift für Geburtskunde*, XXIII, 81). *a* shows the triangular inlet, the ilia possessing only a slight iliac sulcus; *b*, the ranium of a large child in the same pelvis, seen from above in the first ver-ex position; *c*, the pelvic outlet, narrowed into a small triangle by tying he rami of the pubis together, and seen from below; *d*, its dilatation by he child's head, which has brought the pubic arch (vide *b*) and the distance etween the tubera ischii (vide *d*) almost to the normal.

Ruptures of the uterus are quite frequent in osteomalacia. I observed it wice in sixteen cases.

FIG. 120.



a–d, Rubber Pelvis (see above).

The cure of the disease does not improve the prognosis in labor, because the pelvis ossifies in the form which it had at the beginning of recovery, and accordingly retains the beak (Fig. 101).

8. In 49 difficult labors due to tumors of the pelvis, half of the mothers died (6 undelivered), and 44 children died.

9. Among the five known cases of labor with pelvis fissa one patient died

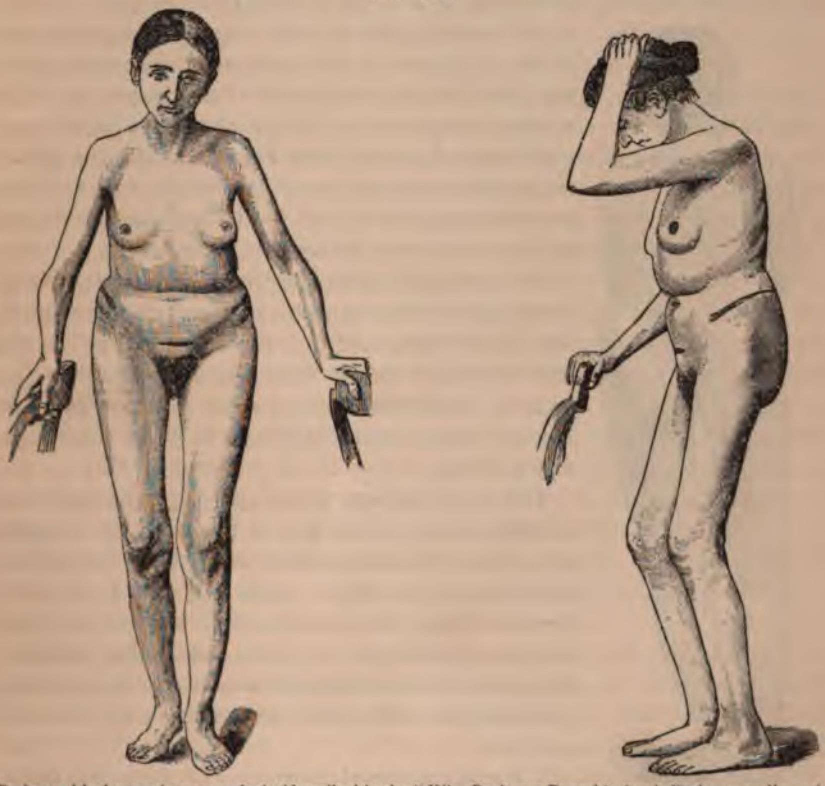
of sepsis (*Litzmann's* case); the other cases were terminated artificially, but were quite easy.

Diagnosis.—Whenever the possibility of previous disease of the pelvic bones is indicated by the small size of a pregnant woman, by teeth with markedly transverse fissures or by their imperfect position, by curvature of the spine, by an unusual gait or by bony cicatrices, or when a pronounced pendulous abdomen, prolonged high position of the head, unfavorable presentation of the cranium or swelling of the maternal soft parts during labor point to an obstruction in the pelvis, we should subject the entire bony system of the pregnant woman to a careful examination, after obtaining a very thorough previous history. In such cases we must not satisfy ourselves with merely ascertaining the ordinary, formerly mentioned (page 101) measurements of the greater and lesser pelvis, but must make the most complete instrumental and manual measurements possible. Even the external manual palpation of the pelvis occasionally affords a starting point for deciding upon its shape and the utilization of the results of measurement. In addition to the diameters, which permit an inference with regard to the pelvic inlet, we must sometimes add the measurement of the pelvic outlet. This is best done, according to Breisky's recommendations, by measuring with a Baudelocque, in lateral decubitus, the distance from the point which corresponds externally to the end of the sacrum (at the upper boundary of the movable coccyx) to the ligamentum arcuatum. According to Garfunkel, the size of this narrow conjugate is 10–14 cm. (on the average 12.3 cm.) in the living subject. The transverse diameter of the pelvic outlet may be measured according to K. Schroeder's plan, the position of the tubera (labia interna) being marked with a blue pencil on the external integument, in the position for stone, and their distance measured directly; or according to Breisky's plan by drawing a horizontal line transversly through the anus, somewhat nearer to its perineal border, to the inner border of the tubera ischii. The tubera are situated close to the outer boundary of the posterior part of the gluteal fold, and the distance between them is measured with a pair of calipers whose branches can be made to diverge. According to Garfunkel, this distance between the tuberosities of the ischium is 9.4 cm. in the living subject (8–10.8 cm.), 9.2 cm. in the dead body; but the actual distance is greater by the thickness of the soft parts 1.4 cm. on the average (0.8–2 cm.).

The distance between the trochanters only possesses value so far as regards transversely contracted pelves, and therefore also the osteomalacic pelvis. The oblique diameters, from one tuber ischii to the opposite anterior and posterior superior spines, and the measurement of the height and width of the ilia, are important in obliquely contracted pelves.

The number of instruments devised for exact internal measurement is very large. Skutsch has very recently furnished a complete résumé and good criticism of these instruments, and, at the same time, has described a complicated new one, ingeniously combined from various other measuring apparatus. This may deservedly find employment in clinics, in the case of bashful women, and, under certain circumstances, after the administration of an anæsthetic. However, we maintain that, by careful palpation of the entire inner surface of the pelvic walls with two fingers, an expert can measure the conjugates, the transverse diameters of the lesser pelvis as accurately as with the best instruments, because these are also apt to lead to false conclusions. Without undervaluing in the least the careful attempts at the improvement of internal measurement of the pelvis with instruments, we will usually succeed by the simplest measurement with the hand, and will restrict the complicated methods to a few especially difficult cases in hospitals.

FIG. 121.

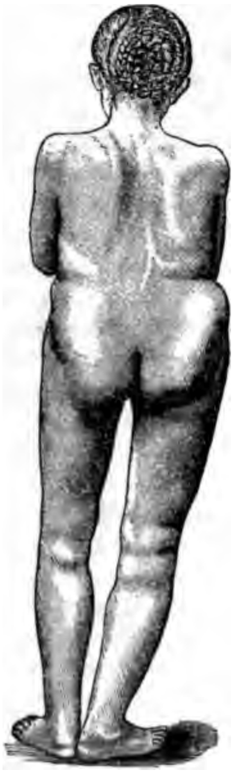


Patient with rheumatic osteomalacia (described in the "Klin. Beob. zur Dystokie durch Beckenenge," p. 59).

As regards the diagnosis of individual forms of contracted pelvis, the following points are to be specially considered. In the uniformly contracted pelvis, the small size of the individual, the uniform diminution of the measurements, the absence of rachitic residua, which are found in the generally

contracted flat pelvis, and the simple flat pelvis. In the simple fla
shortening of the external and diagonal conjugate, without chan
difference between the measurements of the spinæ and cristæ (dir
equality or reversal of the normal) are noticed, while it testifies in
the rachitic flat pelvis when the distance between the spinæ is eq
greater than that between the cristæ. The transversely fissured te
rosary-shaped swellings of the costal cartilages, the curvature of the
still more marked evidences of a past rachit
pare Figs. 47 and 48, page 242).

FIG. 122.



IIpara with spondyl-olisthesis. Delivered July 6, 1882, of a living child, with forceps (vide "Klin. Beob. z. Dystokie," etc., p. 44). The insertion of the thorax between the ilia, the transverse groove, the displacement of the sacrum backward and upward, are noticeable, but not as marked as in Fig. 119.

In the diagnosis of the osteomalacic pe
chief symptoms are the protracted rheumat
the poor gait, the tenderness of the bones,
spasms, the transverse furrow above the pe
barrel-shaped thorax (vide Fig. 121). In th
itself, the displacement of its anterior wall
the narrowing of the pelvic outlet and the bea
tion are very easily recognized appearances.

The spondyl-olisthetic pelvis is often easil
nized by the changed shape of the pregnant
the approximation of the thorax to the pe
roof-shaped projection of the spine in fron
sacrum, the palpable sliding angle and the
common iliac arteries in the lesser pelvis (*vi*
119 and 122).

The obliquely contracted pelvis is reco
from the different position of the hips, the
gait, the considerable difference between the
diameters of the greater pelvis (1½–4 cm.)
unequal distance between the posterior superi
and the spinous process of the last lumbar
In addition it exhibits displacement of the
genitalia and often flattening of the pubic
one side.

The easily detected narrowing of the pelv
is of diagnostic value in the lumbo-sacral
and also the funnel-shaped pelvis. Other
former resembles the spondyl-olisthetic pelv
transverse furrow upon the trunk, as well as t
ward displacement of the upper part of the
and the fact that the common iliac arteries ca
in the lesser pelvis, as I was able to determ
certainty in my case. The presence of cicatrices, the clinical hi
prolonged sickness and extensive destruction of bone, and the abse

sliding angle in the lesser pelvis, will guard us against mistaking it for the spondyl-olisthetic pelvis.

Finally, tumors of the pelvic walls will be recognized by their immobility, their firm connection with the pelvic bones, and occasionally by the fact that several are found in different places. The size, shape, consistence and surface will furnish information concerning their character and significance.

In some cases, after the completion of labor, the conjugate can be directly measured, after pushing the uterus to one side, by introducing the closed fist or a broad wooden staff. To this measurement we must then add, for the soft parts, about as much as in measuring the distance between the tubera ischii, *i.e.*, about 1.5 cm.

The plan practiced by P. Müller and F. Schatz (*Centralbl. f. Gynäk.*, 1885, IX, 660) and which follows naturally from the remarks we have already made, is important in regard to the prognosis of labors in narrowing of the pelvis. From the time at which the fœtus becomes viable, they press the occiput of the child's head from time to time into the pelvic inlet in the direction of the axis of the pelvis, controlling its descent through the vagina. This pressure performed with moderate force every 8–10 days for 1–1½ minute, affords the most accurate determination of the proper period for induced premature delivery. This becomes necessary when the head can only be pressed into the pelvis to such an extent that it still projects above the symphysis by a full centimetre (*Schatz*).

Treatment.—In my clinical observations on dystocia from narrowing of the pelvis, I have described the artificial aid which I was compelled to render in 300 cases of contraction of the pelvis, the strictest indications being formulated. From these it appeared that seven-tenths of all labors in contracted pelves ran a spontaneous course, and of these only 2.4 per cent. of the mothers and 17.6 per cent. of the children died, *i.e.*, about three times as much as normal.

Among 72 labors with narrowing of the pelvis, Michaelis observed a successful and easy labor 28 times, a difficult labor but without artificial aid 23 times, *i. e.*, 70 per cent. spontaneous cases; 21 were terminated by operation. 5 mothers died, 16 children were stillborn, 58 were born alive.

The first therapeutic proposition which we must therefore formulate, is the following: Inasmuch as such favorable results have not been obtained and cannot be obtained by any other plan of treatment, the attending physician must wait and watch so long as the spontaneous delivery of the child appears possible and free from danger. At the same time it is self-evident that we must not stand idly by. It is an especially important factor to retain the bag of waters intact as long as possible. Not alone must the examination be made as gently as possible, but the patient must be forbidden to throw herself about restlessly in bed. At times, when the presenting part of the child is firmly engaged, the colpeurynter will do good service in this regard.

If the position of the presenting part of the child is not especially favorable, it must be improved by a suitable position of the parturient woman. In pendulous abdomen and posterior parietal position the half-sitting position is advisable; when the head slips off, it is advisable to place the patient on the side toward which the head escapes; if a brow or face presentation is in course of development, we will order that lateral decubitus which corresponds to the position of the face. At the same time, the fundus uteri must be supported by a pillow in order that it may not sink over too far. By external pressure upon the presenting part of the child we can also correct its presentation, convert a posterior parietal position into a bi-parietal presentation, etc.

Furthermore, the regulation of the activity of the pains is especially important. When the pains are too severe in a certain position of the woman, we will act favorably upon them by changing the position; other causes, such as fullness of the bladder or rectum, which may be present, should be relieved as soon as possible. Premature straining and pressing must be forbidden, painfulness of certain parts of the uterus relieved by warm or hot chamomile compresses, or by a warm bath, the application of a mustard leaf, or an enema of chloral hydrate (1 gm. to 25 gm. of distilled water); when this proves unsuccessful, by an opium enema (15–25 drops in 21 gm. water), a hypodermic injection of morphine (0.01) or chloroform inhalations.

In rigidity and swelling of the soft parts we may inject every hour 1–2 litres of antiseptic fluids (boracic acid 3 per cent., carbolic acid 3 per cent., corrosive sublimate $\frac{1}{10}$ per cent.), with mucilaginous solutions (althæa, flaxseed).

We must caution against overloading the stomach with food or drink; the activity of the skin is to be maintained, not stimulated or depressed; keeping the feet warm is important; walking about after the escape of the waters is to be permitted only in exceptional cases. Attention should also be paid to the patient's bed, in order that a beginning bed-sore may not develop during labor as the result of constant rolling up and down upon wet sheets.

In the further course of labor, the advance of the head should be carefully noted, and the physician should not be deceived by the enlarging cephalhæmatoma. The best data will be furnished by a comparison between the level of the spinæ ischii and the convexity of the head, and between the latter and the concavity of the sacrum. The displacement of the head at the sutures and the change in the relation of the fontanelles to the pelvis and to one another, must be controlled at each examination. As we have seen, narrowing of the pelvis *per se* does not, by any means, indicate the operative termination of labor, but it is apt to lead to dangers which compel such a course. For example, if the pains are insufficient in the uniformly contracted pelves, but the conditions for the use of forceps are fulfilled, the operation may not be delayed as soon as pressure symptoms, such as swelling of the soft parts, make their appearance. In the generally contracted flat pelvis we are often compelled, on account of the danger to mother and child when the pains are exhausted, to extract the head with the forceps, although the former is still situated at the pelvic inlet; an oblique position of the head, or an anterior or posterior parietal position (in which one ear is felt), is then unfavorable, and sometimes necessitates the exchange of the forceps for the perforator. The most favorable is the simple flat pelvis, in which the forceps are usually necessary only after overcoming the narrowed conjugate. But if the head is still at the superior strait, a distance between the sagittal suture and the promontory of at least 1½–2 cm., will teach us that extraction with the forceps is possible without special difficulty. Narrowing of the pelvis, as an indication for the forceps, is greatly abused, and it is, therefore, worth while to consider the justification for this indication somewhat more closely. When, in a straight contracted pelvis, the forceps grasp the head across the forehead and occiput, then, if the head is situated transversely, its transverse diameter must be enlarged, and consequently the obstruction increased. When the forceps grasp the head obliquely, its lateral parts are displaced upon one another, and the forehead or occiput can be pressed more firmly upon the superior strait. When the handle is depressed too much or too little, an unfavorable rotation of the child's head around its transverse diameter may occur, and thus considerably increase the difficulty of labor, on account of the lower position of the forehead. In no event can we effect the passage of the head in such an exact and gentle manner, as is done by the forces of nature. A simple, gradually developing impression of the cranium at the promontory is converted, by rapid traction with the forceps, into a fracture with hemorrhage. On the average, the child's head suffers much more from the forceps operation performed on account of contracted pelvis than in other cases, on account of the greater resistance, longer duration of the operation and the more unfavorable position of the blades. The distention of the maternal soft parts also occurs so much more gently the more slowly it takes place, because in drawing the head over contused parts these are more apt to tear, while, on account of the extent of the obstruction, the operator is apt to have a tendency to change the direction of traction, to pass too early from the first into the second position. Under such circumstances, as well as in excessive traction downward, the edges of the blades of the forceps make incisions into the cervical and vaginal walls. In view of all these facts, we are justified in the statement that forceps extraction in contracted pelvis is much more dangerous than in other cases, and that it is not only not indicated by the narrowing, *eo ipso*, but is contra-indicated. But that we must resort to the forceps when danger to the mother or child threatens or has already developed, is self-evident. As we can show by very many examples, the course of labor, in the same parturient woman and with increasing size of the child, depends upon so many other factors, such as position of the head, pendulous abdomen, pains, mobility of the sutures, etc., that not even in those cases in which the forceps had formerly been necessary on account of pelvic contraction, can we foretell the necessity of a repetition of this operation in a subsequent confinement. Finally, we must remember the conditions under which this operation must be performed in ordinary private practice,—faulty bed, unskilled assistants, poor illumination, insufficient narcosis,—all of which factors often make the operation much more difficult. A very ripe experience concerning the sad results of such operations, even in the milder cases, compels the writer to utter an urgent caution against the use of the forceps, as being not justified by narrowing of the pelvis alone, and to demand of every one that he should confine this operation in contraction of the pelvis to those alone in whom an impending or already present danger to the mother or child, provided the other conditions are fulfilled, imperatively demands that the labor be terminated by operation as quickly as possible.

When the cranium is situated perfectly transversely, it should be grasped as obliquely as possible. I have always succeeded in this way in my cases, and I therefore regard the grasping of the head over the forehead and occiput as certainly avoidable, and urgently advise, in behalf of the child, that the forceps be locked in an oblique direction. The axis-traction forceps, especially that devised by Breus, do excellent service in the extraction of the head situated at the pelvic inlet. In order to be able to exert all our strength, and at the same time to have a hold on the patient at the upper trochanter, whereby this is fixed at the same time, she may be brought into the lateral position before or after the application of the forceps. In this position the head is drawn more easily into the inlet. Strong compression of the handles, rotations and pendulum movements, are entirely superfluous, even injurious. In other respects, compare Part VI, Section II, "Forceps Operation."

If the disproportion is so great that the head does not follow, despite proper traction and firmly-applied, properly-grasping forceps, perforation of the skull is indicated. When the child is dead, this may be performed at once; when living, only when the chances for saving it are already diminished and stand in no proportion to the danger which would accrue to the patient from the continuance and increase of the pressure during labor. In such cases we will sacrifice the then probably lost child and quickly remove, by the evacuation of the head, the danger threatening the mother. Those obstetricians who abhor perforation of the living child would be compelled to make Cæsarean section in such cases. But they would thus not only expose the mother to the greater dangers of Cæsarean section as compared with perforation, in favor of an already-endangered child and one that often dies during the first year of childhood, but even after a successful operation would have predisposed the patient to the danger of rupture of the uterus in a subsequent pregnancy. As we cannot certainly prevent the development of an abdominal hernia by the most carefully sutured laparotomy, so are we unable to guarantee that a uterus, sutured according to Sänger's method, will not rupture in a subsequent pregnancy. In almost all such cases the woman is lost if the physician is not at hand very quickly, while, if the living but endangered child is perforated, she may afterward bear a number of living children, either spontaneously or by induced premature delivery.

If we neither wish to perforate the living child nor to perform Cæsarean section, we should transfer the conduct of the case to another physician, because we are then at the end of our tether, and thus, at least, avoid the responsibility of exposing the woman, until the death of the child has occurred, to the danger of rupture of the uterus.

If the head is high and is still movable, or if a face presentation with the chin directed backward is present and its conversion into a vertex presentation has failed, despite slight narrowing of the pelvis, then version, followed by extraction, is indicated, provided the child is alive and can probably be kept alive. If this is not so, perforation, even before complete dilatation of the os uteri, would be better for the patient. Certain limits for the forceps operation and for version have been sought, and these, or even perforation, have been regarded as directly indicated as soon as the true conjugate measures less than 7 cm. I have shown in another place that such a rule is untenable, and have proven that the extraction of a living child is possible even at 6.75 cm. On the other hand, it has been advised that, even in the moderate grades of pelvic narrowing, version should be performed at once if the head does not enter the inlet at the beginning of labor, because we can then terminate the labor artificially at any time and independently of the pains, and because the after-coming head will pass through the pelvis more readily than the fore-coming head, and the former can also be placed in a more favorable position as regards the pelvis; for example, the broader occiput can be placed over the wider half of the pelvis. These are assumptions in which the activity of the uterus is very much underestimated, because, even after engagement of the trunk, we can by no means regulate, as we wish, the position and engagement of the fœtal head, which is more or less firmly compressed by the uterus. If the head does not enter with the apex of the wedge (the chin), but in such a way that the mento-occipital diameter enters the transverse diameter of the introitus, the extraction is very difficult and the child is generally lost, even apart from the compression of the funis which occurs so often in version, the difficult rotation in longitudinal positions of the child, and the often very tedious loosening of the arms.

These facts, accordingly, have recently induced several writers not to recommend internal version *per se* in pelvic contraction, but, on the contrary, to convert pelvic into vertex presentations by external version, in order to secure for the children the advantages of vertex presentation.

The indication as regards the frequency of version in contraction of the pelvis still varies greatly in different clinics. In Halle it was performed (according to Weidling) in 21 per cent. of all cases of pelvic narrowing, by me in only 10 per cent. of the cases. But if we find after spontaneous labor in contraction of the pelvis only 12 per cent. stillborn children, after forceps delivery 27.7 per cent., after version 40.8 per cent., and after extraction 55 per cent. when version is favored, these figures are by no means encouraging for version, entirely apart from the danger to the mother. According to my results, the mortality among the children after the forceps operation in pelvic contraction was only 18.3 per cent., after version and extraction 51.6 per cent.; among mothers 4.0 per cent. and 3.1 per cent.

If extraction of the fœtal head does not succeed after perforation with the cranioclast or Mesnard's cranial forceps—the cephalotribe is dangerous and perfectly superfluous, as will be proven in another place—then the child can be delivered by version and extraction, because room has been made by removal of the cranial bones.

In such cases, and in those in which, despite the slighter grades of pelvic contraction, several especially large children are stillborn in succession, furthermore in simple flat and generally contracted flat pelves whose true conjugate measures at least 7 cm., the induction of premature labor is indicated. If such individuals come under our observation only at the normal end of pregnancy and with a fully-developed child, perforation must be performed as early as possible when the fœtus is dead; when the fœtus is still vigorous there is a relative indication for Cæsarean section, taking into consideration the remarks made on the previous pages (pp. 500, 501).

Finally, if the smallest diameter of the pelvis measures less than 6 cm. there is undoubtedly an absolute indication for Cæsarean section, and the only question, when this occurs is, whether, in order to relieve the woman, once for all, of the dangers of another pregnancy, it would not be preferable to replace Cæsarean section by Porro's operation. In my opinion the answer should be formulated in the following way: When we have to deal with a very feeble, miserable individual in poor circumstances—for example, a person suffering from chronic osteomalacia—or with one who already has several healthy children, an osteomalacic individual, or one upon whom the conservative Cæsarean section has been performed successfully for several children (*Michaelis, Winckel, Sr.*), then Porro's operation is probably the most humane. But if the parturient woman is primipara or pluripara; if she has no child or only one; if she is otherwise healthy and possessed of good powers of endurance, then it is evident that the conservative Cæsarean section according to Sänger's method is absolutely indicated.

As regards the induction of abortion in contraction of the pelvis, I refer to its indications among the obstetrical operations, and will only remark that Litzmann does not mention it in the treatment of pelvic narrowing in pregnancy. But so long as we claim for the physician the right to kill a living child for the sake of the mother, we cannot deny the justification of the induction of abortion in absolute pelvic narrowing.

The following are the results of operative treatment in pelvic contraction in obstetrical clinics; with strict antiseptic methods the mortality of parturient women can be reduced to 5 per cent., perhaps even to 4 per cent. About 30 per cent. must be terminated by operation; of these 6 per cent. of the mothers and 29.6 per cent. of the children succumb. The forceps operation occurs in about 15 per cent., *i. e.*, five times as often as in other cases; version in 10.3 per cent.; perforation with subsequent cranioclasis in 13.1 per cent. Induced premature delivery will be necessary in about 3 per cent. of all contracted pelves and reposition of a prolapsed funis in the same number.

From all these statements it follows that we should not interfere too early, but only when danger to the mother or child is impending or actually present. Furthermore, the life of the child should not be regarded too lightly. We should not resort forthwith to the perforator even when the true conjugate is narrowed below 7 cm., because even here a living child may be extracted with forceps, because children born with deep bony depressions are often kept alive, and because, even after former perforations, living children may be delivered spontaneously.

CHAPTER II.

Disturbances of Labor Due to Faulty Labor Pains.

The contractions of the uterus that are intended to expel the fœtus may be faulty in three ways: They may be (1) too weak, (2) too strong or (3) too spasmodic.

1. Weak Labor Pains.

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Definition.—A labor pain that, in regard to its periodicity, to the interval between it and the preceding one, is perfectly normal for the first stage of labor, would be too weak in the second stage. Furthermore, the same p[illegible]in may be perfectly normal in the case of normal resistance, but not quite su[illegible]fficient when the resistance in any one spot becomes immoderate. The regu[illegible]lar pains, too, as already mentioned, are not to be considered as entirely al[illegible]ke in regard to duration, stages, intervals and to their gradual developme[illegible]t; so that the line cannot always be drawn very accurately between a nor[illegible]al pain and one that is too weak. We have, however, generally to do, not w[illegible]th a single one, but with a whole series of abnormal pains, and these are m[illegible]re easily distinguished from entirely normal pains. By too weak pains I understand such as in any particular case, in view of the resistance on t[illegible]he part of the parturient canal and also on the part of the fœtus and its app[illegible]ndages, are too short in their duration and not strong enough at their ac[illegible]e, so that they do not advance parturition; they are too sluggish when th[illegible]ey recur at unusually long intervals. On Wigand's authority ("Geburt des Me[illegible]nschen," Vol. 1, Berlin, 1820), three degrees of weak pains have been d[illegible]istinguished: He called the first *inertia uteri:* in this case the pains w[illegible]re described as too short from the outset, and the intervals as too long; to t[illegible]he second he gave the name of *atonia uteri*, in which pains that at first w[illegible]re quite strong became in the course of labor gradually weaker and less frequen[illegible]t; the third he designated *paralysis uteri*, complete exhaustion and part[illegible]ial paralysis of the uterus, which, he remarked, occurred most frequently in t[illegible]he third stage. To this division it has been rightly objected that the d[illegible]istinction between the degrees is not clear enough. Weak pains were th[illegible]en divided into primary and secondary, the latter including Wigand's secon[illegible]d and third degrees; but this division also was found unsuitable, because i[illegible] was said there was scarcely any difference between them in regard to t[illegible]he prognosis and treatment, and also because the diagnosis of a secondary wea[illegible] pain required a close observation of the entire labor, which in private pra[illegible]tice is often impossible. Consequently, C. v. Braun distinguished weak pai[illegible] either as *hemiparesis uteri*, in which contractions would follow only upon th[illegible] application of powerful stimuli, or as *paresis uteri*, recognizable by the tot[illegible] absence of pains. As for me, I prefer a division according to the caus[illegible] and I distinguish a direct weakness of pains proceeding from the uterus itsel[illegible] and depending upon its shape, position, nutrition and development, and a[illegible] indirect weakness caused by faulty conditions of other organs. Both of thes[illegible] must again be subdivided into a primary weakness, existing already at th[illegible] beginning of parturition, and a secondary, arising after regular labor pain[illegible] have begun; and again there is a distinction between partial and total weakness, of which more hereafter.

Etiology.—The causes of the *direct weakness* of labor pains lie in th[illegible] uterus itself; they are: unusually poor development of its muscular structure, which is due partly to a defective development and is partly a consequence of chlorosis. It is noticeable that, according to many authors, weakness of the pains is also said to be hereditary (partly owing to imperfect excitability, partly on account of a defective development of the muscular coats). A faulty shape, especially the absence of the fundus uteri in uterus bicornis and unicornis, predisposes to weakness of the pains; so do abnormal presentations, a pendulous abdomen, and prolapsus uteri. Other important causes are: considerable losses of blood which affect the organ directly, for instance, in placenta prævia; and relaxation of its muscular coats through several miscarriages, as well as through too frequent pregnancies at short intervals. Of 275 cases of weak pains, Hugenberger found 11 per cent. in women of 40 to 53 years, who had borne from 10 to 12 children (!). Although Hohl thinks that age has nothing to do with the origin of this weakness, yet it is a significant fact that Hugenberger found 9 per cent. of the cases in very young primiparæ (15 to 18 years), and nearly the same ratio in older primiparæ of 30 to 38 years of age. Besides, weak pains occur in primiparæ generally more than twice as frequently as in multiparæ, which is probably to be explained by the exhaustion of the uterus caused by the greater resistance of the soft parts during the first parturition. Over-distention of the organ is not unfrequently a cause of too weak pains, as for instance, in the delivery of the first twin, also in case of an excess of amniotic fluid (hydramnios). Here the cause is often only the separation and the unusual distention of the uterine fibres and the diminished contact with the parts of the child, for as soon as the fluid has run out and the walls have contracted around the fœtus, quite frequent and strong pains occur, which quickly force out the child. To the foregoing are to be added: diseased conditions, as chronic and acute inflammations, metritis, incipient metro-peritonitis, and also new formations of the organ, as myomata and cancer. There are two conditions of the organ which formerly were often cited as causes and are still mentioned in many text-books, although their existence is at least questionable, or at all events difficult to discover and easily misunderstood, viz.: *rheumatism of the uterus*, for which, I think, inflammation is often mistaken, and the so-called plethora uteri. On the other hand, rigidity, cicatrices and ruptures of the uterus are among the well-ascertained causes of weak labor pains.

The *indirect weakness* of the pains, that which does not proceed immediately from the uterus, may have the following causes:—

In the second stage of labor the main cause of weak pains in a primipara is said to be insufficient action of the abdominal muscles; the uterine body has drawn so far back over the child, that only a small portion of the latter lies in it, and it cannot exert any great amount of force when, in primiparæ, the head presses on the floor of the pelvis (*Ahlfeld*). Furthermore, a weakening effect is produced upon the pains by distention of one of the pelvic or abdominal organs, especially long and excessive retention of urine, constipation, overloading of the stomach, inflation of the intestines with gas, etc. These causes make the contractions of the uterus painful because with each contraction there is a more or less painful compression of these organs. And they may also prevent the uterus from assuming its normal longitudinal position and the presenting fœtal part from engaging properly, consequently the fœtal sac does not come above the os uteri and the pelvic inlet. Likewise, inflammation of the above-mentioned organs, and in general any diseased conditions of them (for instance, continued vomiting, typhoid, cholera, peritonitis) may hinder the development of powerful labor pains, partly owing to the suffering, partly to the considerable loss of fluids connected with these diseases. I must, however, mention that the actual strength of a pregnant woman at a given time affords no means of judging accurately of the expulsive power of her uterus; for it not unfrequently happens that a thoroughly exhausted consumptive is quickly and easily delivered shortly before death; and also in cases of fever, when the patient is much weakened, an unusually quick delivery often takes place.

Most authors also mention as causes: strongly developed panniculus adiposus, hydræmic conditions, general plethora, anxiety, excitement, and particularly sudden emotions of the parturient. It is said that weakening of the pains has often been caused by the unexpected entrance of a surgeon whom the patient did not know, by the unlooked-for arrival of near relatives, by the rattling of instruments. My own experience has more than once been the reverse of this; and I have seen the parturient, frightened by the sight of the instruments and the preparations for the operation, gather together all her strength, and at the last moment end the labor spontaneously. Generally speaking, much depends upon the will and energy of the parturient, who in the second stage avails herself but little, if at all, of the abdominal muscles; owing to this, together with other causes, many women have weak pains at every confinement, having familiarized themselves with the idea that anyhow they cannot be delivered without artificial help.

Some authors have spoken of an epidemic occurrence of weak pains, but surely this rather high-sounding term can have but little significance except at times, when catarrhal affections being frequent, many parturients in succession present anomalies of the pains which are directly connected with such catarrhal diseases.

Symptomatology.—If, in the case of direct weakness of the pains, the uterus is not diseased, the insufficiency of the contractile power in the first stage of labor shows itself by tardy dilatation of the cervix, by insufficient distention of the membranes during the pain, by a very slight advance of the fœtus, and by a greater mobility of the latter, even during the pain. After the rupture of the membranes, a small caput is formed or none at all, the bones of the head are not pushed over one another, the mouth of the uterus hangs relaxed around the head. Pulse, respiration and temperature in such parturients are at first the same as in healthy gravidæ; in some instances

I have shown them to be often somewhat lower; for instance, the temperature will vary between 98.5° and 99.1° F., because the patients lie quietly in bed with but little clothing, and eat sparingly.

But this condition does not always continue; partly through the long pressure of the fœtal parts, partly through the incidental swelling or inflammation of the genitals, fever sometimes sets in, especially in the second stage, the parts become sensitive, the abdomen somewhat swollen, and vomiting accompanies the pains. Total absence of pains, or even spasmodic pains, may then follow. Pains occur in the abdomen, in the loins, in the back; sometimes, also, cramps in the calf of the leg; the parturient becomes uneasy, impatient and low-spirited, throws herself about frequently, and becomes gradually weak, even if the pains do not increase much. The distention of the bladder is often accompanied by a very unpleasant sense of pressure in the abdomen, the parturient herself makes no effort at straining, but frequently changes her position, as if to get rid of the pressure exerted by the contracting uterus upon the distended organ. In the third stage, hemorrhages and tardy expulsion of the placenta occur.

The long pressure and the considerable dragging on the parturient canal frequently cause necroses, and later on fistulæ. If there have been previous diseased conditions of the abdominal or thoracic viscera, their symptoms will show themselves, together with those of the weak pains, and there will be an increase of fever and of soreness in the affected parts, in spite of the slow progress of the labor. In such patients, as well as in those who have been long in labor, the face becomes at last flushed and anxious, the veins of both face and neck are swollen, and there appears a heated condition, which has been looked upon as an indication of plethora, calling for bleeding. If the labor pains gradually disappear, the patients become quieter, they may fall asleep, the labor ceases for 12–24 hours, or even longer, and the parturients, upon awaking, find themselves strengthened and able to make the best use of the renewed labor pains, so that they may themselves successfully terminate the delivery.

It is quite otherwise when there is complete exhaustion of the uterus, or when a diseased condition, perhaps even a rupture, of the uterine wall has occurred. If, then, the labor pains grow weaker, or cease altogether, whether in the first or in the second stage of labor, the patient is in a decidedly critical condition. The danger, however, does not arise from the weakness of the pains, but lies in its causes, as, for instance, the rupture of the uterus (q. v.), which I have already mentioned when treating of pelvic contraction.

From the above-mentioned causes of the direct weakness of labor pains, it naturally follows that there must also be a partial and a general weakness. It cannot be doubted that special parts of the uterus, as, for instance, the fundus or the neck of the uterus, or the region of the placental insertion, cr that of the orifices of the tubes, cannot contract as easily as all the others. This is quite well known in the third stage, and has been used in explaining certain displacements of the uterus, for instance, inversion. Cazeaux, consequently, says, in regard to weak pains, accompanying an excessive distortion of the uterus: "The pains seem to be only in the fundus, not in the lower part of the organ." Many authors (Klob, l. c., p. 226) also mention "irregularity of the contractions," followed by a yielding of some of the thinner parts of the muscular wall, as a cause of rupture of the uterus. It is evident that a circumscribed metritis, or a premature fatty degeneration of the muscular structure of the gravid uterus, must greatly diminish the power of contraction and endurance of the affected parts. The os internum and neck of the uterus will frequently suffer in this respect, because they are most affected by previous labors. It is also a fact that, for twelve hours after delivery the neck of the uterus mostly hangs relaxed and gaping, and is, therefore, far less contracted than the body of the uterus. Fatty degeneration of the muscular structure in the neighborhood of lacerations has been proven in a most thorough manner by Klob, Lehmann and Rokitansky (see *Klob*), and still more frequent is a great disproportion between the thickness of the body and that of the lower uterine segment.

Myomata of the uterus must also cause irregular contractions; and the parts around them, which are made thinner by the strongly developed swelling, will be but little, if at all, affected by the contraction of the uterus. The danger of hemorrhage shortly after delivery may arise, as Ramsbotham has shown from his own experience, from the absence of contractile power in these parts.

The course of labor may vary considerably, according to the location of the parts in which the power of contraction is weak. In the case of general weakness of the pains, labor will, as before stated, be retarded; when the weak pains are in the fundus, it is also very much protracted; in the second stage, a steadily increasing caput succedaneum may form, because the fœtal part is constricted by the cervix and the os uteri, and the uneven pressure upon the child may cause a diminution in the force and frequency of its cardiac sounds, which is a dangerous symptom. If the part that is insufficiently contracted is in the anterior or in the posterior wall of the uterus, labor may be perfectly normal in the first and second stages; that part is more bulged out during the pains; it is exposed to greater pressure than the others, and may consequently suffer lacerations (see above); moreover, if it is near the placenta, it may, in the third stage, become the seat of profuse hemorrhages. Finally, when the neck and mouth of the uterus are insufficiently contracted, but the fundus is normal, we witness an abnormally quick dilatation of the cervix and passage of the child through it, but as early as the second stage this rapid course of labor subsides, especially in primiparæ; and in the case of multiparæ we sometimes find that the same woman will repeatedly have profuse bleeding after the quick expulsion of the child and of the afterbirth. Thus many labors may be regarded as apparently precipitate, and the quick effect of the labor pains may be ascribed to their excellent development, the subsequent hemorrhage being attributed to a so-called too quick evacuation of the uterus, while, in fact, the cause of both is the insufficient resistance of the cervix, occasioned by the partial weakness of the labor pains.

Diagnosis.—In the diagnosis of weak pains, Hohl points out two dangerous errors that must be avoided. It is erroneous to consider, on the one hand, those pains too weak which at first recur at long intervals and do not act as yet upon the cervix uteri, but are said only to serve to separate the fœtus and its membranes from the surface of the uterus, and, on the other hand, those apparently inactive pains, which tend only to improve the engagement of the fœtal part, and not to assist labor. But still there are other mistakes to be avoided. First of all, it is not enough to base a diagnosis of weak pains on the mere internal examination, and on the fact that the presenting part of the child does not advance. The character of the pains must be ascertained by palpation of the uterus, by measuring their duration and the intervals between them; this applies not only to one pain, but to a number of consecutive ones; and at the same time the pulse and temperature of the patient must be watched. C. Braun asserts that in the case of weak pains the pulse does not show the usual acceleration during the pain; but this acceleration does not always occur, and its absence is by no means rare even in normal pains; and, on the other hand, it may be seen even with unmistakably weak pains, especially when feverish conditions exist. The temperature also will rise abnormally in such cases, while it is mostly low in the first stage, when the weak pains are not accompanied by inflammation. There is no doubt that in private practice weak pains are more frequently diagnosed than they actually occur, and are then made the occasion for the use of the forceps. In Nassau (*Franqué*, Wiesbaden, 1866, Tab. IV), during the years 1843–1859, out of 5055 forceps deliveries, 2231 were done on account of weak pains; for 820 (!) others no reason was given; but only 3 (!) such operations were undertaken on account of the diminution of the cardiac sounds of the child. In the clinics the ratio of these indications is, as it ought to be, almost reversed.

When an internal examination is made, especial consideration must be given to the condition of the cervix and the os internum; for it is easy to suppose the labor pains to be defective if the os externum is found not to be continually distended by the pains, while they have been acting upon the os internum and the cervix, dilating and enlarging them. Finally the position and rotation of the presenting part of the child must be controlled by repeated examination; and a careful exploration of the lesser pelvis must not be neglected.

If the cause of the difficulty in the progress of the labor is not found directly in the uterus, immediate attention must be given to the bladder and rectum, the intestines and stomach; the spleen, the liver and the thoracic viscera examined, and the general condition of the patient must be watched; frequent measurement of the temperature is also indispensable.

The *prognosis* varies according to the stage of labor, the time of the rupture of the membranes, the extent, duration and intensity of the weak pains. In the first stage, and when the membranes are still intact, these are of little importance; they are more significant, however, when in the course, and especially at the beginning, of the first stage, the membranes are ruptured, for this retards the dilatation of the cervix, the head and the other parts of the child are compressed for a longer time and more directly, and its life may be endangered, especially in the case of abnormal presentations, like a face or breech; they also occur quite often in the first stage, in symmetrically contracted pelves. It is therefore incorrect to maintain, because weak pains have no pathological effect in the first stage of labor, that they do not exist at all in it.

The prognosis is far more unfavorable after the escape of the waters in the second stage; it is dangerous for both mother and child if the period of expulsion lasts more than 7 or 8 hours after the rupture of the fœtal membranes. Generally speaking, however, it is better in partial than in total weakness of the pains, and better when the weakness appears at the beginning of labor, than when it is secondary and only occurs after strong contractions; in the latter case the child is in greater danger from the previous pains and efforts at delivery, and the mother, too, may succumb, unless quickly relieved. Mention must be made here of the spasmodic pains originating in weak ones, caused perhaps by improper dietetic regulations or too frequent and rough examinations. According to the researches of Burns, Simpson, Veit, Braun, Späth and others, in all cases of labor lasting over two days, the mortality among the mothers increased every six hours in arithmetical proportion, and Hugenberger found that, of 187 who had been affected with weak pains, 47, or 33 per cent., were sick in the puerperium, and of these eight, or 5.8 per cent., died; these figures, however, were all collected before Lister's time. In the lying-in hospital of St. Petersburg, Hugenberger tells us, only 2.1 per cent. of the children died on account of weak pains and delayed labor, but 2.9 per cent. where these were followed by operation.

The general weakness of the pains is most unfavorable in the third stage; it is followed by violent, often very dangerous hemorrhage. This is also the case in partial atony of the placental site; while, on the other hand, the defective contraction of the cervix, or of the ostia of the Fallopian tubes or of one wall, is of far less importance if they are not the site of the placenta.

Treatment.—The treatment varies according to the stage of labor, the causes and the extent of the affection.

Before the rupture of the fœtal membranes, and in the first stage of labor, nothing is to be done except to guard the patient against accidents; if the position and presentation are normal, she may walk about as long as the os uteri is not too wide. Toward the end of the first stage, change of position, application of an enema and a few vaginal injections are generally sufficient, but, above all, patience! After the rupture of the membranes, the first thing to do, in the first stage, is, to remove the causes, if possible, and if this does not increase the activity of the pains, it must be stimulated by the use of dynamic means, namely: in weak, enfeebled, languid, delicate individuals, by excitants, as wine, tincture of cinnamon, castoreum, bouillon and egg, chocolate, strong coffee, given in small doses; further, by external and internal warm applications, especially the warm and hot vaginal douche (100–110° F.), a pailful at a time. This also does good in the higher grades of partial weakness of the pains. It may be very beneficial when there is inflammation of the cervix uteri, by washing off the secretions and diminishing the soreness of the inflamed parts.

The douche must be repeated every hour or two. For improving the pains, Arberg recommended cataplasms over the fundus, as hot as they can be borne.

Another equally efficacious and perfectly safe remedy after the rupture of the membranes is the introduction into the cavity of the uterus of laminaria or tupelo tents, or an elastic catheter. Even when the fœtal membranes are still unruptured, the activity of the pains is increased by the use of these bougies, and their introduction, far from being impossible, is not particularly difficult. I prefer laminaria or tupelo bougies to the elastic catheter, because their distention stimulates the uterus more rapidly and powerfully, and their action is therefore quicker. It is only in case of inflammatory affections of the uterus that these excitants are not to be recommended.

The introduction into the vagina of the colpeurynter, filled with warm or cold water, is still easier. Joulin also advised the use of Tarnier's dilator or of the sponge tent.

All these means of dilatation—made, of course, strictly aseptic—are particularly to be recommended when the first stage of labor is retarded by over-distention of the uterus in cases of twin birth and hydramnios. They are certainly safer than the rupture of the fœtal membranes, recommended by several authors; this ought to be resorted to only toward the end, not at the beginning of the first stage.

Generally speaking, if the rupture of the membranes is to be used as a harmless means for improving the character of labor pains, it is only when the os uteri is fully or almost fully dilated, when the presenting part of the child has entered the pelvis or shows a disposition constantly to recede, and I cannot repeat too often the advice that great care must be taken not to proceed too quickly with this operation. For this reason, I do not look with favor upon C. v. Braun's advice to resort to the rupture of the membranes when the head is low down, and the os externum has remained unchanged for some hours and the pains have ceased.

In indirect weakness of labor pains in the first stage, caused by weakness or diseases of other organs, these anomalies must first, if possible, be removed. A distended bladder must be emptied with the catheter if the patient cannot urinate voluntarily. When the head is low down, it is best to use an elastic catheter that is not too hard nor too thick; if it cannot be introduced while the patient is on her back, let her be placed on the side or across the bed, and if this should fail, because the head is too tightly pressed against the urethra, the presenting part should be raised somewhat by two fingers pressing upon the anterior vaginal vault; should even this be insufficient, the woman must be placed in the knee-chest position, when the catheterization will certainly be successful. I have never failed to succeed by one or the other of these methods, even in cases where several obstetricians had already made numerous fruitless attempts. When the rectum is distended, repeated enemata must be used; if the stomach is overloaded, let a gentle emetic be given. Parturients generally vomit without difficulty, so over-strong doses must be avoided. Ipecac in powders often brings on vomiting, in doses of 0.1–0.3 gm.; otherwise, use 0.01–0.02 gm. of tartar emetic. Parker asserted of the latter that it intensifies the power of contraction, increases the mucous secretion of the genital tract, and relaxes the muscular structure of the intestines. He gave of a solution 0.05–0.1 gm. in a wineglass, one tablespoonful every 10–15 minutes until nausea ensued. When there is an excessive formation of gas in the intestines, some warm chamomile or peppermint tea may afford relief; and for painfulness and colic-like neuralgias of the intestines, repeated applications of mustard plasters, as large as the palm of the hand, or rubbing the sore spot with liniments (lin. volatile with tinct. theb.), are often followed by good results. In feverish affections, it may be necessary at once to use antipyretics in powerful doses—antipyrine, 0.5 gm.; antifebrine, 0.25 gm. Quinine, in doses of 0.25 and 0.5 gm., has often been prescribed as a tonic, antipyretic and oxytocic remedy (*Wood-Kleinwächter*). If the patient suffers much pain, quick relief may be obtained by internal administration of opiates, as tinct. thebaica or Dover's powders, or tinct. thebaica added to enemata. Still more powerful is the administration through the rectum of 1 gm. of chloral hydrate, once or twice a day.

In the second stage of labor *dynamic* remedies must also be used first. I mention above all secale cornutum (ergot) and its preparations: ergotinum dialysatum and fluid extract, according to Schatz and Kohlmann, then cornutine. Besides these, in special cases, a prolonged warm bath of 15–30 minutes (95°–97° F.), with repeated addition of hot water, is to be recommended.

According to Wernich's observations, ergotin lessens the tension of the veins and increases their dilatation; this produces arterial anæmia of the uterus and of its nerve centres, which increases the duration and intensity of its contractions; after strong doses the intervals cease altogether, and a condition very like tetanus uteri sets in. According to Kobert this is due to the sphacelic acid contained in ergot, while the ergotinic acid, which is also found in it, has no effect on the uterus, whether gravid or not. The third constituent part of ergot, Kobert's cornutine, a pure alkaloid, was, according to M. Gräfe's and Erhard's experiments (*Centralbl. f. Gynäk.*, 1866, No. 20 and 33), given repeatedly in the first stage of labor in doses of 5 mg.; in nearly two-thirds of the cases it improved the pains and did the mother no harm; but M. Gräfe thought it injurious to the child. Already C. v. Braun, Cazeaux, Scanzoni, Nägele, Grenser and Spiegelberg have regarded ergotin as dangerous, especially in the first stage, because by producing too violent pains it might cause an excessive compression of the child, a sudden diminution in the force and frequency of the heart-sounds, premature separation of the placenta, and uterine hemorrhages, and because the tetanoid condition, instead of accelerating labor, might retard it dangerously. I have also seen a very remarkable case that proves the danger of large doses, and in another case I suspected that the remedy had caused the tetanus ("Temperaturstudien," 1862, p. 26). Therefore, in my clinic, I allow the use of ergotin only when, in the second stage, no unusual mechanical obstacles prevent the expulsion of the child, and when, on the other hand, mother and child are not in so critical a condition as to point to the necessity of an operation. It must not, therefore, be given when there is incarceration of one of the cervical lips, when there is any inflammation of the uterus or surrounding parts, when the presentation is oblique, or there is a faulty engagement of the presenting part, when tetanus or stricture of the uterus is present, when the lesser pelvis or the vulva is obstructed by tumors. Hence it is seen that ergotin cannot be used very often. On the contrary, I have recently prescribed the fluid extract, prepared by Schatz-Kohlmann, 12 drops two or three times daily, even in the first stage of labor. I also use, with good results, Wernich's preparation, or the officinal preparation: extract. secalis cornuti aquosum, in doses of 0.05 gm. three or four times daily, internally or hypodermatically. Kleinwächter and Parvin have recommended to use it jointly with tincture of cinnamon, 10–15 drops of it to a teaspoonful of the latter. It can also be recommended as a prophylactic, to prevent relaxation of the organ when an operation is necessary; but in such cases the physician must not rely upon this remedy alone; he must rub the organ with the hand, and endeavor to produce powerful contractions by this means.

This massage, rubbing and kneading of the uterus, especially during the pains, and on the fundus, was employed in the earliest times and among the most ancient nations, for improving the strength of pains, and was systematized to a complete method, by Kristeller (*Monatsschrift*, xxix, 367), who gave it the name of expressio fœtus. This is performed just like expressio placentæ; it is suitable only in cases of longitudinal presentations of the child, of inflammation, stricture and tetanus of the uterus. It can therefore be resorted to whenever internal or mechanical remedies have been used because the labor pains were either wanting or too weak; whenever, therefore, the symptoms point to the use of ergot, the application of the forceps and of manual extraction, and also to supplement the action of relaxed abdominal muscles. Years ago (1855) C. v. Braun thought that massage of the fundus uteri was advisable only when a natural termination of labor might be expected after a few more contractions. But the removal of the placenta by means of pressure long ago revealed the fact that a methodically increased compression of the uterus can be borne without any injurious effects, not only for a few minutes, but for hours.

If the head is visible in the vulvar orifice and does not advance, Ritgen's method, or that recently re-introduced by Fehling may be employed.

If the head is not yet within reach of the finger, Ahlfeld's advice is to construct an obstetric chair out of two stools so placed together that, their hind legs touching, the front legs will be 30 cm. apart; on this the woman is to be placed until the child's head stretches the vulva wide open.

Electricity has also been applied to improve direct weakness of the pains. Hugenberger reports that in the St. Petersburg lying-in hospital, since 1858, the galvanic current has proved a powerful agent for the production of energetic labor pains, and has in five cases arrested dangerous hemorrhages from atony of the uterus in the third stage. Recently Baird (*American Journal of Obstetrics*, 1885) and others have spoken highly of it. It is enough to press one pole on the anterior wall of the uterus and the other on the sacrum, or by means of a speculum on the anterior lip of the cervix. As the effects of electricity are identical with those of ergot, its application must take place under the same conditions.

In the second stage of labor, if the safety of mother and child forbids longer delay, and the above-mentioned expressio fœtus should not succeed, other artificial methods must be applied. If the head is within reach of the forceps they must be applied, also in prolapse of the umbilical cord or when there is an elevation in the temperature of the mother above 101.3° F. Charpentier recommends the use of the forceps when the head has remained two hours in the vagina without advancing. I do not agree with him, because this help may come too late as well as too early; and I disapprove altogether of A. H. Smith's and Taylor's advice, in the first stage, before the os uteri is fully dilated, to pull down the child's head with the forceps, so that it shall press on the os uteri (*Parvin*, l. c., 442). Artificial help must be resorted to early, whenever some other disease, not proceeding from the uterus, considerably retards labor. If the pelvic extremity presents, the extraction must be performed by it. But, unless the character of the pains is much improved, the obstetrician must proceed *slowly* in all methods of extraction, and direct his assistant to rub and knead the fundus uteri, so that expression and extraction may be *simultaneous.* For weak pains are a counter-indication to the extraction of the child from the uterus, because it may bring on considerable hemorrhage and retard the loosening of the placenta. It is *not,* however, the weak pains that make the operation necessary, but the danger to mother and child of a slow, prolonged labor.

I shall finally mention a number of other remedies which have been proposed and applied for improving the character of weak pains, both in the first and in the second stage: some of these are obsolete, others will evidently be so before long. Pickel, Braun and others recommend the application of a child to the breasts, especially in cases of adynamia uteri due to placenta prævia; again, Wigand, Cazeaux (titiller!) recommend friction of the clitoris, and C. Braun rubbing the inner surface of the uterus with the finger. Vernon spoke highly of the efficacy of strychnine in atony of the uterus. Finally, bleeding was frequently practiced, especially in plethoric patients, in order to remove the so-called plethora of the uterus. This was recommended by Rusch, Siebold, Mendars, Spiegelberg, Cazeaux, Nägele and Grenser; but Scanzoni and C. Braun declared themselves against it, the latter adducing as a reason for its uselessness the fact that in the Vienna clinics there had never been any indication for it, and it had never been practiced. At the present time it is, I think, quite obsolete. The efficacy of borax, of inf. herb. uvæ ursi and of cannabis indica for acting on the pains has not been confirmed. The hypodermic application of a 2-per-cent solution of pilocarpine (*Welponer*) is very troublesome and ineffective (*C. v. Braun*). I shall speak further on of the treatment of weak pains in the third stage.

2. Too Strong Pains, Tumultuous Pains and Precipitate Labor. Hyperdynamia Uteri. Partus Præcipitatus.

LITERATURE.

Winckel: "Die Bedeutung präcipitirter Geburten u. s. w." München, 1884.

Definition and Etiology.—The pains are too strong when their action, under normal resistances, ends the labor too quickly by overcoming these, not gradually, but violently and rapidly. When labor terminates unusually quickly, or with the child falling on the floor, it has been designated "precipitate labor" (Sturzgeburt): this has generally been associated with certain other conditions, as, for instance, a small fœtus, a wide, slightly tilted pelvis and yielding soft parts.

But in order rightly to understand the significance of precipitate labors a distinction must be made between those that occur when the parturient is lying in bed and those that take place when she is standing, squatting or sitting: the latter are the so-called street-labors (Gassengeburten). While in the former strong pains are absolutely necessary, and labor cannot end quickly without them, the activity of the pains in upright positions is quite variable; it may be very strong and powerful, so that the child is actually flung out and thrown with a certain amount of violence on the floor, especially when there is but an inappreciable amount of resistance from the vagina and the perinæum. Or the pains are of normal force and, while the parturient is walking or standing, the child comes so slowly that the mother can sometimes catch it while it is borne down to the floor by its own weight without any violence. Or again, the pains have been, on the whole, moderate before the rupture of the membranes; the sac has, however, descended quite low, the consequent dilatation has caused the parturient, still walking or standing, to assist by her own efforts at straining; at the acme of the pain the membranes are suddenly ruptured, the child quickly enters the os uteri with the escaping waters, thus causing renewed efforts at straining on the part of the patient, and a powerful exertion of the abdominal muscles expels the child from the yielding genitals at the same time with the amniotic fluid; the child breaks the umbilical cord and falls to the floor. It is clear that these three different forms of precipitate labor may have different consequences for both mother and child.

As with weak pains, three degrees of too strong pains have been distinguished. Wigand (loc. cit., Bd. 1, p. 68) makes the following division: precipitate pains, in which there still are intervals, and, the pelvis being very wide and the child very small, labor ends quickly; then over-rapid pains (Wehenübereilung), in which the intervals are shorter, the excitement greater, often accompanied by vomiting; and in the third place, as the highest degree, tumultuous pains (Wehenüberstürzung), in which there are scarcely any intervals, but the most violent pains follow one upon another without any intermission. This distinction is scarcely exact; and here, too, I deem it more to the purpose to divide too strong pains into such as have their cause and origin directly in the uterus, and such as are produced by faulty or diseased conditions of other organs.

Most authors assign to the first class: unusual excitability of the sensory nerves or of the muscular fibres of the uterus, frequently found in excitable individuals, in an inflamed condition of the uterus, or after previous dysmenorrhœa. Furthermore, an especially strong, disproportionate development of the muscular structure of the fundus as compared with that of the cervix; here it must be noticed that too strong labor pains are said to be hereditary in many families (according to Cazeaux, to the third and fourth generation [!]), and moreover that in many women they recur at each labor. The supposition that the force of the pains increases with the resistance is said by Schatz to be false (?). It is beyond doubt that under great exertions a muscle tends to hypertrophy, and equally so, that it can perform more or less weak, and more or less strong contractions; it is therefore improbable that the above-mentioned supposition is always true. Plethora of the organ has also been adduced as another cause. Again, shortness of the umbilical cord, whether coiled or absolutely too short, is said often to produce tumultuous pains (Wehensturm) through painful pulling on the placental site (*Wigand*); this is confirmed by my own observations. For my investigations of the etiology of precipitate labors proved that the chief predisposing causes lie in powerful labor pains, twin or multiple pregnancy, diseased condition of the parturient (syphilis, bronchitis, epilepsy), smallness and maceration of the fœtus, and abnormal shortness of the umbilical cord; but that the exciting factors are to be looked for in the movements of the parturient, together with the rupture of the fœtal membranes caused by walking, and that in many cases the repeated precipitate labor of some women is to be ascribed to a combination of three or four causes. Fright, excitement, strong emotions, were not prominent factors in the 250 cases observed by me.

Among the indirect causes must be counted all abnormal obstacles which the uterus meets in the process of expulsion: therefore oblique presentations, contraction of the pelvis and hydrocephalus. Violent premature efforts at straining on the part of the parturient may sometimes, in the first stage, make the pains too strong and precipitate the delivery. The activity of the pains may also, as I have already said, be suddenly increased by fear, anxiety, fright, suddene motions, and the sight of obstetric instruments. It is remarkable that in many serious diseases, especially scarlet fever, small-pox, pneumonia and generally in the so-called zymotic diseases, labor pains are often very violent, and by quickly following each other bring about the rapid expulsion of the fœtus. According to Tyler Smith, the sudden death of a pregnant woman by suffocation or drowning often produces in a few minutes a partial expulsion of the fœtus, which is due jointly to fright, to carbonic acid poisoning and to death itself. Perhaps, also, the unusual non-resistance of the soft parts, which was considered the cause of precipitate labor in the above-mentioned diseases, may predispose a pregnant woman to this accident in case of sudden death; cold may also contribute to it, as, for instance, in drowning. Too strong labor pains occur in about 0.4 per cent. of all parturients, and multiparæ are liable to be affected with them about three times as frequently as primiparæ.

The *phenomena* and *consequences* of too strong pains vary according to the resistance offered by the pelvis, the child and the soft parts. If the pelvis is of normal width, the child normally developed and the soft parts not too much relaxed, the labor is only unusually quick. The parturients are early seen to make efforts at straining, the expression of the face is often anxious, and in the intervals they complain because the short pauses scarcely give them time to recover themselves. Owing to the violent straining efforts which, in spite of all advice, they cannot help making, the face soon becomes flushed, now and then they utter a loud shriek, and all at once, when the os uteri was scarcely thought to be dilated, the child is precipitated through the outer genitals. During the almost unceasing pains, some parturients complain of a fixed pain in some particular spot of the body, which may be due to the too short or coiled umbilical cord pulling on the placenta.

The labor pains are not always too strong from the outset; frequently, indeed usually, they begin toward the end of the first stage to increase in violence, frequency and force; sometimes only a few pains are too strong, or even only one; perhaps, unfortunately, the very last expulsive pain. A case of this kind is cited in Braun, Chiari and Späth's Clinic (p. 75): The patient was a primipara, 26 years old; the os uteri was rigid, the pains weak and labor during the first stage very slow; the second stage lasted but half an hour, and as the midwife was about placing a cushion under the patient's pelvis, a rather strong pain occurred, and all at once the child was thrown out 1½ feet from the genitals, so that the thick, strongly gelatinous, brittle umbilical cord, which was only twelve inches long, broke in the middle; the child was in a breech presentation, nine lunar months old and macerated.

If the pains have been pretty strong for a considerable time, if the soft and the pelvic parts are normal and the child not too large, the precipitate labor can take place, while the patient is in a horizontal position, without any danger to either mother or child; this will take from ¼ to ½ hour in multiparæ, and from one to two hours in primiparæ. But if the membranes are ruptured early, if the os uteri is not well prepared, if the child's head is hard and unyielding, it will be almost impossible to avoid lacerations and subsequent hemorrhages of the uterus. Lesions of the cervix may be followed by complications during the puerperium. Besides, if the vulva is narrow, not easily stretched, and not very moist, the precipitate expulsion of the child may be accompanied by an extensive perineal rupture. Precipitate labors are also sometimes accompanied by syncope, collapse, hemorrhages, delayed expulsion of the placenta, inversion of the uterus and prolapse with inversion. The fainting in such cases has been attributed to the sudden evacuation of the uterus, which, when the abdominal vêssels are suddenly freed from pressure, would produce considerable congestion, from which cerebral anæmia would result. Hemorrhages and placental retention are also caused by relaxation of this organ, and the former are sometimes so violent and serious that, in a very few minutes after the expulsion of the child, the relaxed uterus is well filled with blood, which the contraction of the internal os prevents from escaping. Inversion with prolapsus uteri is generally caused by the strong traction of the umbilical cord on the placenta. Finally, when the cervix uteri is unyielding, prolapse alone may be caused during the expulsion of the child's head by the tumultuous pains joined with tremendous [abdominal pressure. It will be readily seen that, in cases of precipitate and of sudden labor, there is little opportunity for taking observations of the pulse, respiration and temperature; it is difficult enough to watch the progress of labor. I have shown at length (loc. cit., p. 38–40) that in precipitate labors, which take place out of bed, the soft parts of the parturients are more frequently wounded than when the patient lies in a horizontal position; even multiparæ in such cases are injured more than twice as often as under ordinary circumstances; but the cause lies not alone in the abnormal rapidity of the labor, nor in the size of the child, but in the peculiar position and attitude of the parturient. In labors of this kind, we also find that hemorrhages in the third stage and immediately after, due to a tearing of the placenta or of the fœtal membranes, are more frequent, profuse and dangerous than at other times. The proportion of these is greater in primiparæ; after very precipitate labors the uterus of multiparæ relaxes more easily. The dragging upon and lacerations of the umbilical cord can be demonstrated as important predisposing factors of these hemorrhages (Author, l. c., p. 42); indeed, even when thoroughly competent medical help is at hand at the moment of birth, the tearing of the placenta and the obstinate relaxation of the uterus caused by the precipitate labor may, in a short time, seriously endanger the patient's life.

I have still to mention another phenomenon which may accompany excessively violent straining, namely, emphysema of the throat, neck and chest of the parturient;* this may arise, either from a slight lesion of the trachea or a bronchus or (as observed by Hunter and Miller, *British Med. Jour.*, October 24th, 1885), perhaps, from a slight wound on the inner surface of the cheek. It develops rapidly; the skin is at first pale, tense, crepitant to the touch, but soon becomes red, so that one might suspect erysipelas.

As the opening through which the air has escaped is rarely large, it soon closes again, and the emphysema disappears in 5 or 6 days (*Blundell, Schroeder*). I have never seen a case of this kind.

Women who have precipitate labors are more liable to sickness in childbed than other parturients; they are principally affected with puerperal ulcers, œdema, slight parametritis, hemorrhages and especially often with retention of urine; still, if they have not been examined during confinement by midwife or physician, and if immediately after delivery no instruments (catheter, syringe) have been used on them, they are almost certain to remain free from fever. It has already been mentioned that in precipitate labor the umbilical cord often breaks and that this may in special cases cause fatal hemorrhage to the child. On the other hand, I have seen but one instance of hæmatoma on the head, clearly traceable to the fall of the child on the floor; the tumor measured 8 cm., and the child, a boy of 34 cm., weighed 1010 gm. I have never known of the child receiving serious injuries from its precipitation on the floor or its too rapid expulsion; and in children born alive no particular predisposition to diseases was to be observed during the time immediately after its delivery. However, the mortality among children in precipitate labors is *greater* than in normal (non-precipitate) labors (4.9 : 2.5 per cent.), and as causes of death I have observed the following: (loc. cit., p. 50) abnormally great cerebral pressure, pressure on the umbilical cord, and suffocation in an unfavorable position. The occurrence of a cephalhæmatoma with defects of ossification must not be left unmentioned during precipitate labor.

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* *Literature.* Benson, J. S.: *Canada Lancet*, Toronto, 1883–1884, XVI, 235. Boxall, R.: *Lancet*, London, 1887, I, 122. Champneys: *Brit. Med. Journ.*, London, 1884, II, 963, and *Med. Chir. Trans.*, London, 1885, LXVIII, 37–68. Dunn (4 cases): *Boston M. and S. J.*, 1883, CVIII, 397. Hunter: *Brit. Med. Journ.*, London, 1885, II, 791. Kiralyfi: *Pester med. chir. Presse*, 1885, XXI, 389. Miller, A. C. (2 cases): *Brit. Med. Journ.*, London, 1885, II, 1108.

Treatment.—Parturients who have had a previous precipitate labor, or who exhibit predispositions to a parturition of this kind, must go to bed at the very beginning of the labor pains; it is best for them to lie on one side; they must by no means give way to the desire to strain; they must evacuate both rectum and bladder in bed while lying down, and during the pains they must have nothing to take hold of. If, nevertheless, the pains are too strong, their severity may be greatly diminished by painting the cervical canal with a 4–10 per cent. solution of cocaine, as long as the liquor amnii has not escaped; if this does not help, mustard leaves may be applied to the abdomen, or 20 drops of tinctura thebaïca injected into the rectum, or an enema of chloral hydrate (1 : 25 aq. dest.), or a hypodermic injection of morphine may be given, or finally, the patient may be made to inhale chloroform. Experience has also indicated the rupture of the membranes before the complete dilatation of the cervix has taken place, since this is many times followed by a pause in the pains. It, however, is a doubtful remedy, since, if the severity and intensity of the pains do not subside, the maternal soft parts of the child are subjected to much greater danger than they were before.

In such labors as these it is indispensable that the perineum should be carefully protected, the presenting part held back, the afterbirth not be removed too hastily (the expulsion of which is best left to nature), a prophylactic injection of ergotin, 0.05, given immediately after the delivery of the child, and the contractions of the uterus carefully watched for some time afterward.

3. Spasmodic Pains.

LITERATURE.

Clay: *Brit. Med. Journ.*, 1886, I, 1108. Criado y Aguilar: "Drillingsgeburt mit Tetanus (?)," *Ann. de obst. Ginepat. y ped.*, Madrid, 1883, 2 ep., III, 229. Giberson: *Pacific M. and S. J.*, San Francisco, 1885, XXVIII, 657. Hubert: *Revue Méd.*, Louvain, 1885, IV, 109 (Ergotin-Tetanus). Johnstone: *Glasgow Med. Journ.*, 1887, 4 S., XXVII, 188. Kirch: *Osservatore*, Torino, 1884, XX, 52. McKee, E. S.: *Chicago M. and S. Examiner*, 1884, XLVIII, 365. Musser: *Practitioner*, Lancaster, 1884, II, 27. O'Connor: *Brit. Med. Journ.*, London, 1884, I, 716. Ramdohr: Post-Grad. Med. School, New York, 1886–1887, II, 224. Roper: *Centralbl. f. Gynäk.*, 1881, V, 416. Rosso: *Ann. de obst. Ginecop. y ped.*, Madrid, 1887, VII, 97. Schatz: *Centralbl. f. Gynäk.*, 1884, VIII, 648. Shugert: *Med. and Surg. Reporter*, Philad., 1882, XLVII, 609. Strong: *Boston Med. and Surg. Journ.*, 1887, CXVI, 543–545. Tate: *Peoria Med. Monthly*, 1886–1887, VII, 5. Winckel: "Klin. Beobachtungen zur Pathologie der Geburt," Rostock, 1869.

Any contraction of the uterus which is abnormally painful or is faulty as regards its direction, duration and effect, is a spasmodic pain. Various forms of these are to be distinguished, viz., the clonic, where they occur at longer or shorter intervals, and the tonic, in which the pauses are present, but can only be recognized by some special apparatus, on account of their extremely short duration. Both forms may be either general or partial; the general tonic contractions constitute tetanus; the partial tonic, trismus or strictura uteri; the general and partial clonic, spasmodic pains in the narrowest sense.

The *causes* of all these anomalies are very much alike; they vary only in their locality and in degree, and are divided into the direct or those which proceed from the uterus and its contents, and the indirect or those which proceed from other organs or are caused by some pathological condition. The most conspicuous among the former, are diseases of the neck of the uterus and the vault of the vagina, especially endometritis, also the early and premature discharge of the liquor amnii, excessive pressure upon and incarceration of separate portions of the uterus in contracted pelves, faulty presentations, unfavorable engagement of the presenting part, as, for example, in face presentations. As we have already stated, premature detachment of the normally located placenta is often associated with exceptionally painful and very inefficient uterine contractions. According to Roper, trismus is said to occur in the first stage of labor, especially when the cervix is undeveloped, in premature deliveries and faulty fœtal presentations. It is frequently found with placenta prævia, and is, perhaps, more frequent with this than with any other complication. Bayer makes the same statement. Further, irritation of the inner surface of the uterus by frequent rough examinations, traction on the child with the hand or the forceps before the complete dilatation of the cervix, the improper and excessive use of oxytocics, especially ergot and hot drinks, rough attempts at the introduction of the hand and the forcible passage of the latter during attempts at version, are to be enumerated as the most important causes. Powerful emotions must likewise be included. In the third stage, repeated traction on the cord, or antecedent traction on the placenta in precipitate labors, will produce abnormally strong uterine contractions. Schatz thinks he has established by measurements that the force of the pains remains almost constant during the course of labor, or increases only about one-quarter, because the force diminishes with the shortening of smooth as well as of striated muscles, the increased power of action of the thickened uterine wall being about equalized by the diminished power of the shortened muscles, and he is correct so far as this applies to a normal delivery. How rapidly, however, tetanus may be developed from normal and moderately forcible pains, can be best appreciated by any one who, like myself, is frequently compelled to take charge of a delivery immediately after his assistants have been making vain attempts at version. Such a form of trismus may make it absolutely impossible for a skilled obstetrician to pass his hand into the rigidly contracted uterus, even when the patient is anæsthetized. Whoever has frequently felt the stretched cervix, much resembling a tense fiddle-string, and has appreciated its extreme sensitiveness, will not be in doubt as regards the existence of a trismus uteri.

(*a*) *Tetanus uteri.*—In this rigid spasm of the uterus the contraction of the organ is permanent at the acme of the condition. The general, symmetrical, continuous contraction, as a rule, develops by degrees, seldom instantaneously; in the same way there may be a sudden general subsidence of the trouble, or the return to a state of repose is preceded by a number of constrictions. The duration of tetanus varies considerably, it may last for hours or subside very quickly. More frequent than this, is:—

(*b*) *Strictura uteri.*—This occurs partly at the external os, where it is called trismus, partly at the internal os, partly at the orifices of the tubes; in short, wherever the circular fibres are most numerous. Hohl contends that it may occur also in the body of the uterus, since one may be easily mistaken as to its height, and it must be conceded that the latter is correct. The stricture, however, does not consist alone of a contraction of the circular fibres, but it is highly probable that where these are abnormally contracted, the longitudinal fibres are more or less involved. For Kehrer, in his experiments on animals, found that the transverse section of the irritated portion became circular, and the circumference smaller transversely, so that a broad transverse furrow arose with deep longitudinal ones, between which the bundles of the outer longitudinal fibres, compressed into a saddle shape, were rendered sharply prominent. The constriction either passes off or develops into a continuous contraction. In classifying a *strictura ex atonia* along with *strictura spastica*, a condition is falsely called a stricture which is a normal contraction of the lower segment occurring in atony of the body of the uterus. It is not far from the truth to say that the opposition which is often met with at the "contraction ring" on the introduction of the hand to remove the placenta, is easily mistaken for a spasmodic constriction.

The *symptoms* of tetanus and stricture of the uterus differ only in degree. They consist of violent pains, loud whimperings and groans from the parturient; anxiety, excitability and great restlessness, and at times even hallucinations are present. These symptoms are increased with each examination, and the patient frequently struggles violently against it. Strangury and rectal tenesmus, pain in the sacrum, neuralgia of the lower extremities, especially cramps in the calves of the legs, which are sometimes spoken of as metastatic pains, occur. The temperature rises and, according to the duration of the anomalous pains, reaches as high as 104° F., seldom higher; it sinks rapidly, as soon as the pains have moderated, provided no other complication has arisen. These symptoms may pass into general convulsions if the excitement becomes very great. If the membranes have already ruptured, the fœtal parts are firmly grasped by the uterus, and a rapidly-increasing tumor can be recognized on the part which has escaped from the uterus. The interchange of the gases between the mother and child must be seriously interfered with in tetanus; consequently, the child speedily dies. This is not so much to be feared in cases of stricture or trismus. If the tetanus or stricture subsides, complete exhaustion and inefficiency of the pains may follow; or else a more or less regular uterine activity continues. Not infrequently external and internal hemorrhages occur with tetanus after the rupture of the membranes, inasmuch as the placenta becomes partially detached, and with the birth of the child a large mass of black coagula escapes. The subject of strictures occurring in the third stage will be considered later on. The existence of tetanus can also be proven on the child after its birth. I once saw a very fine example of this, where the body, which had been so enormously compressed in the uterus, was waxy pale as far as the neck, and in a state of death-like rigidity; the head and neck, however, were deeply cyanotic.

Diagnosis.—The general board-like hardness and permanent contraction of the uterus, together with the excessive pain and increased temperature, the complete arrest of the delivery, the well-marked swelling of the presenting fœtal part and the characteristic general symptoms, make the diagnosis of tetanus easy. Trismus is recognized by the sharp, tensely-stretched, very sensitive os uteri, and from the fact that its size remains unchanged for hours even after very forcible but very painful uterine contractions; the small and well-defined cranial tumor is also suggestive of it. Stricture changes the form of the uterus, prevents the advance of the presenting part or the placenta, is also very painful, and is associated with elevated temperature.

The prognosis is most favorable in trismus, because mother and child suffer the least; less favorable in stricture; and the earlier this occurs after the rupture of the membranes and the longer it lasts, the worse is the prognosis. It is most unfavorable in tetanus; almost all of the children are lost, as they are either stillborn or die shortly after birth. The prognosis for the mother depends on the causes; the worst cases are those in which tetanus arises after attempts at version have been made (see a very interesting case in my "Berichte und Studien," 1). Complications must be feared during the puerperium, if the affection occurs after forceps-operations or other instrumental interference. Lacerations of the uterus, of course, may be produced if attempts be made to overcome such contractions with force; a common form of injury is separation of this organ from the vault of the vagina.

Treatment.—By way of prophylaxis we may employ the measures suggested under the head of tumultuous pains. Warmth, cutaneous derivation, morphine hypodermatically and chloroform to the stage of complete anæsthesia are to be used as early as possible for both tetanus and stricture. Sulphate of atropine, 0.001 gm., has been combined with morphine with good results (*Fränkel*). For the milder cases we may enumerate as reliable antispasmodics: the emetics, ipecacuanha and tartarated antimony, opium by the rectum or the mouth, prolonged warm baths, warm applications over the abdomen or narcotic liniments; scarification of the cervical lips or the local abstraction of blood by leeches should be used by all means, instead of the much-recommended venesection.

The artificial termination of the labor, however, should be avoided so long as any spastic contraction is present. The forceps slip, the soft parts of the mother are lacerated, perforation does not accomplish anything, the cranioclast tears out; while the extraction is easy as soon as the spasmodic pains have subsided, not infrequently a spontaneous easy delivery takes place, much to the astonishment of the physician.

(*c*) *Spasmodic pains in a more restricted sense.*—The most frequent of these anomalies of the pains are the general or partial clonic contraction, which are distinguished from the normal by the following characteristics: Their pauses are of irregular duration, the difference often being well marked; the pains occur for the most part in groups, one after another, then follows a moderately long pause. The separate stages are not clearly defined and abortive pains very frequently occur. At the same time the several stages show a decidedly greater difference than do normal pains. Their effect is very imperfect, and, finally, they are much more painful than usual. The temperature during these abnormal contractions is elevated, but not so high as in stricture or tetanus; it may reach 102.2° F. The duration of the several stages of labor is thereby prolonged; these spasmodic pains frequently change into secondary weak pains. The life of the child is jeopardized more than in an ordinary delivery; complications frequently arise in the third stage, such as delayed delivery of the placenta and hemorrhages. Such lying-in women are also in greater danger during the puerperium, since parametric exudations occur, as a result of the slow delivery, the more frequent examinations and the extension of the gonorrhœal endometritis, so frequently present, to the inner surface of the body of the uterus.

The *diagnosis* of the clonic spasmodic pains is based upon the more or less long pauses, the abnormal tenderness of the whole or part of the surface of the uterus, on the inefficiency of the frequent and abnormally painful uterine contractions and the rise of temperature accompanying them. One-third of all the cases suffer from vomiting, and early or premature rupture of the membranes, caused by the cervical endometritis, occurs with equal frequency.

Treatment.—As a prophylactic measure it is to be recommended not to harass the parturients by too frequent examinations, if they are suffering from endometritis, or if the head is low down in the small pelvis, the vagina narrow and much granulated, and if the cervix is rather hard to reach. Vaginal injections of a 3 per cent. boric acid or a $\frac{1}{10}$ per cent. sublimate solution should always be given where there is a free, glairy or purulent discharge; the feet and the abdomen should be kept warm. If the skin is cool, we must seek to bring about a free transpiration by warm drinks. The bladder and rectum must be kept empty. The membranes must be preserved intact as long as possible. The painfulness of the uterine contractions is to be controlled by sinapisms, chloroform liniment, chloral hydrate administered by mouth or by enema. Repeated warm baths ameliorate considerably the patient's suffering; the application of warm chamomile or bran bags to the abdomen often produce the best result. If the liquor amnii has prematurely escaped in large quantities, a 3-per-cent. boric acid solution may be injected into the uterus.

Now and then the use of nauseants and mild emetics, as ipecacuanha, is of good service. If the cervix is very rigid, incisions may be made in it under strict antiseptic precautions, provided hot douches have been productive of no results.

Operative interference should be postponed so long as there is no indication on the part of the mother or the child for terminating the delivery. The natural pains being unable to effect the dilatation of the diseased genital tract, how could we do it with the forceps? The clonic spasms may be inadvertently transformed into the tonic variety and the extraction would be rendered much more difficult. The third stage might be seriously protracted and the hemorrhage increased to a dangerous degree. Not infrequently the prolonged inhalation of chloroform or nitrous oxide gas with oxygen will lessen the painfulness of the contractions and improve their effect. The physician in such cases must watch the patient for at least one hour, whether the labor be terminated spontaneously or artificially, in order to see that the uterus is well contracted and to prevent any hemorrhage. He will do well to leave the expulsion of the placenta entirely to nature, refraining as much as possible from any external and internal manipulations of the uterus.

CHAPTER III.

Disturbances of Labor Due to a Faulty Development of the Uterus and the Vagina.

LITERATURE.

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If, in the first place, we set out to formulate from a purely theoretical standpoint the results which may be produced during pregnancy and labor from faulty development or formation of the soft tissues of the parturient canal, we would be obliged to assume the following possibilities in reference to pregnancy: Since the wall of the uterus becomes thinner and less capable of expansion in case of arrested development of one or both of Müller's ducts, and since it is certainly often fixed by the same causes which produce this arrest of development or is changed by antecedent diseases, the result will not infrequently be a premature interruption of pregnancy.

I cite as examples of this fact from the above-mentioned work of L. Fürst: Case 39 of Säxinger, Case 35 of Horand, Case 70 of Greenhalgh, Case 79 of Trier, and besides refer to a case of Meyer, G. Dirner, who observed several abortions, a case of Sotschawa, and one of my own published cases ("Pathol. d. weibl. Sexualorgane," 1881, p. 200.)

It will be scarcely possible to doubt the intimate relation between the premature expulsion of the fœtus and the arrest of development, when three times out of four pregnancy was interrupted, as in the case of Grace (109: Uterus septus, vagina simplex). Dirner's case proves that at times only one horn aborts regularly, while the other permits of the full development of the child.

In a case of uterus unicornis with a rudimentary but hollow secondary cornu, the possibility of an impregnation of the latter is to be borne in mind, whether it occur by extra-uterine transmigration of the semen where there is atresia of the connecting cord (examples: Case 45 of Turner, Case 48 of R. Virchow, Case 50 of Rosenberger), or by the external transmigration of the impregnated ovum (Case 49 of Luschka). Kussmaul collected 12, Jaensch 20 additional cases of this kind, Ruge, Chiari and Jenny each had one, so that altogether we know of 35 examples. The condition of such an impregnated horn resembles more or less that of a tubal pregnancy; it ruptures usually within the first five months; this happened in the cases of Turner, Luschka and Ruge in the third month, in Rosenberger's case in the fifth month, and finally in H. Meyer's case in the seventh month. The fœtus may, exceptionally, go to full term in such a horn; its further course then is the same as in a full-term tubal pregnancy. (Examples: Case 46 of Turner, uterus unicornis dexter cum rudimento cornu sinistri partim excavato gravido. Violent pains commenced at the end of pregnancy, ceased after the third day; the patient died of phthisis after six months. The pregnant horn had a circumference of 63.5 cm.; the fœtus was fully developed.) Angus Macdonald has fully discussed the fact that a large proportion of the cases of so-called "missed labor" belong to this category.

A case of F. Henderson is worthy of mention: the woman, with a uterus infrasimplex supraseptus, passed through seven normal pregnancies; in the first, the menses were more profuse than usual; in the second, she had almost constantly a bloody discharge; in the third, she menstruated three times; in the fourth, fifth and sixth, she did not menstruate, her condition being normal. The patient nursed all her children, and the menses ceased during lactation. This case must be considered as showing the great probability of a continuation of the function of ovulation during pregnancy.

The cases of Scanzoni, Rektorzik and my case of hernia uteri bicornis, graviditas cornu dextr., besides seven other cases, prove that a pregnant horn may escape into a hernial canal. Besides this unusual, faulty position of the uterus, its peculiar shape is often conspicuous; it may be pointed on one side, hollowed out above, distinctly bicornuate, anvil-shaped or obliquely heart-shaped, as in the cases of Birnbaum, Heppner (Case 84) and others.

Since twin-pregnancy is by no means rare in a divided uterine canal, I make mention only of the cases of Hohl, Trier (79), Birnbaum (85), Grace (109), Paris (110), Sotschawa and Lane. Robertson observed a case of triplets in a negress, who had had one child first, then twins, then triplets, then twins again, and last of all triplets. The possibility of super-fecundation, even of super-fœtation must be conceded in such cases of arrested development. The two examples, which probably belong to this category, reported by B. S. Schultze (Case 105) and Paris (110), from other authors, have not been accurately enough observed and the proof is not very strong. In Sotschawa's case, one fœtus is said to have been 1½ months, the other 3 months old.

Finally it is possible that one examiner may decide that a woman is not pregnant, while another, on the contrary, may affirm that she is already in labor, if one-half of a uterus septus with vagina septa is impregnated. Cruveilhier narrates an instructive case of this kind, and the observation of Cappie (Case 107) is of the same nature. At the first examination the cervix was found dilated and the membranes ready to rupture; at the second examination the cervix was merely patulous and no membranes were felt; at the third examination the former condition of affairs was again found and then the septum was finally recognized. The case of John W. Taylor closely resembles it; at first he made his examination always on the non-impregnated side, until he finally discovered the error and delivered a dead child with the forceps.

For various reasons we should expect, in these cases of arrested development, unusual and faulty presentations of the child, partly because the long axis of the uterus is very much shortened and the cavity, in uterus unicornis as well as in bicornis and in arcuatus introrsum, is shaped more or less like an animal's hoof, partly because of the lateral position of the malformed organ and because the direction of the results of its forces crosses, to a greater or less extent, the axis of the inlet of the pelvis. In connection with face presentations I have already called attention to this in reference to the publication of Schatz and shall only cite that very interesting case (84) of Heppner, with a uterus bicornis with vagina simplex, in which a brow presented first, then the knee and the breech were forced down and the child was delivered spontaneously in a breech presentation. In other words, a version about the long axis of the child was produced by the two-horned uterus. Concerning the occurrence of breech presentations I make mention of the cases of Späth (89: uterus introrsum arcuatus septus, vagina simplex, graviditas dextra, breech presentation), of Grace (109: uterus septus, vagina simplex, twins, one child in a footling presentation, the second was turned), and of the one published by myself (uterus unicornis sinistra cum rudim., alt. corn. solido, footling presentation, prolapse of the cord, extraction).

Concerning transverse presentations which are especially frequent in cases of uterus bicornis, I refer to the remarks on page 403. More recent cases of transverse presentation owing to this anomaly are reported by Robertson (second triplet with impaction). Teller (a 35-year-old VIIpara, three transverse presentations, then twins, one in a transverse presentation, with uterus bicornis septus and vagina simplex). Fleischmann-Breisky (39-year-old XIpara, transverse presentation, partus spontan. conduplicato corpore with uterus bicornis unicollis).

Anomalies of the pains must occur often in cases of arrested development for the reasons above mentioned, especially because of the faulty shape of the uterus, the condition of its wall and because of the faulty direction of its contractions. These anomalies consist of inefficient pains and pains which act in a wrong direction. In my case, cited above, the pains were inefficient, as was also the case in the one reported by Cappie, in which the woman was delivered twice with the forceps. I found the pains short and of little effect during the first and second stages in a case of uterus bicornis septus, vagina septa.

In a case of Fürst, the patient, who had a uterus septus, vagina septa, aborted the first time, the second pregnancy is said to have lasted three weeks beyond term; she was in labor three days, during two of which the pains were strong, then they ceased entirely. The obstruction seemed to be (the septum ?) a thick membrane, which, like a hood, enveloped the head laterally when it was forced into the pelvic outlet, and not only prevented it from escaping, but also forced it back. Finally this fold ruptured, and delivery rapidly followed; the child, which was fully developed, was asphyxiated, but was resuscitated.

Birnbaum's case (54) shows that the contraction of both horns may produce an obstruction. During the delivery both cornua became tense, and their forces acted from both sides obliquely downward and in opposite directions, which rendered the expulsion of the fœtus more difficult and made it necessary to extract with the forceps. The placenta was situated chiefly in the left horn, a small part of it, however, was in the neighboring right horn.

Heppner's observations prove that one horn may be firmly contracted, while the other does not contract at all, in spite of long-continued manipulations (uterus bicornis simplex—brow presentation); he was compelled to remove the placenta with the hand. Heppner believes that the natural version observed in this case might have been favored by the circumstance that the contraction of the left horn had acted in a one-sided oblique direction. Teller made similar observations concerning the inequality of the contractions of the two horns. Birnbaum, in his case of twin pregnancy which has already been spoken of (85, uterus bicornis simplex, vagina simplex), made the observation that the fœtus found in the right horn in a first vertex position, was expelled with difficulty, probably because the direction of the contractions of the two horns was opposed to each other. It should be added that in this case the walls of the uterus were thin, in places almost like parchment.

Ruptures of the uterus may, therefore, occur spontaneously, and can be easily produced artificially (examples: cases of Winge and Faye (73), and of Robertson, who found the rent in the fundus of a uterus septus. Breisky found a transverse laceration, involving the mucous membrane and the muscles on the anterior wall of the left horn of a uterus bicornis supraseptus, in a delivery cum conduplicate corpore. Patterson found an artificial subperitoneal laceration of the vagina extending up to the diaphragm in a uterus didelphys.

It is a matter of course, that any existing septum, especially if it is incomplete, may give rise to an obstruction to the delivery. An example of this kind has been already cited in Fürst's case (100). In a 19-year-old primipara, a case of Kemarsky, it was possible to shove the septum back; after the delivery it appeared separated anteriorly for its entire length (uterus septus). Another case is that of Späth (89: uterus introrsum arcuatus septus, vagina simplex, in an 18-year-old primipara. Transmigration of the ovum, graviditas dextra). The septum was partly torn and partly cut through. A third case is that of Benicke (uterus didelphys [?], vagina septa). During the delivery the vaginal septum was torn, and on the 11th day of the puerperium, only traces of it could be seen on the anterior and posterior walls. In a case of Breisky, a cervical septum also was torn through (loc. cit., Case 2). In a case of Werner, it is not accurately stated whether the septum which tore belonged to the cervix or the vagina. I once placed two ligatures around and then cut through a transverse septum situated in the lower part of an otherwise normal uterus, since it offered considerable obstruction to the delivery; one ligature slipped, but no hemorrhage occurred, although the septum was almost as thick as a finger, and the child was born quickly. The case of M. Liebmann, in a 33-year-old primipara, is similar to it.

If the pains are somewhat irregular; if, as has been already mentioned in one case, the insertion of the placenta extends into both horns (Birnbaum: 54), or if their contraction acts in different directions, disturbances are sure to arise in the third stage, and often the manual extraction of the placenta becomes necessary.

Heppner (84) and Birnbaum (85) had to detach the placenta by hand; it was also retained in the case of H. Meyer (see above) and in a case of Faye and Winge (173), by reason of a so-called unyielding contraction of the cervix.

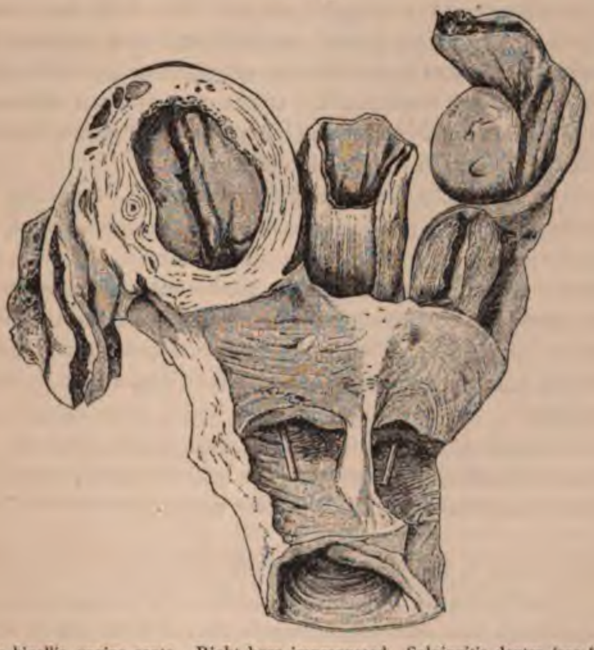
Several times it has happened that the woman has died undelivered during pregnancy or labor, without, as it appears, the occurrence of a rupture.

This was noted in the case observed by Greenhalgh: uterus bicornis septus, graviditas dextra, atresia vaginæ sinistræ (?), death during the pains in the ninth month of gestation. The patient of Dr. Scott, who has already been mentioned (Turner, No. 46), died half a year after pains had occurred, which lasted for days and were of no avail.

From the kind of anomalies of labor which have been described, the further deduction may be drawn, that women who suffer from malformations of the uterus are more often affected with complications during the lying-in period than others, are more easily infected and die more frequently. Thus, the patients of Faye and Winge (73), of Trier (79), of C. v. Braun (78: uterus bicornis partim septus, defect. ren. dextr.), of Späth (89: eclampsia), of Fürst (95: ut. unicornis c. rudimento solido c. a), died during their puerperium from some septic process (Fig. 123), as did also the repeatedly-mentioned case of Heppner (84). Werner's patient died on the fourteenth day, of puerperal mania. For all these reasons the delivery must also be attended more frequently with danger to the children, and their mortality must therefore be much higher than where the parturient canal is normally formed.

It is self-evident that pregnancy or the course of labor is not always disturbed. Betschler's case proves that both processes may pass without any interruption even in the case of uterus bicornis with vagina septa. Horand's case of uterus bicornis partim septus, vagina simplex with ligamentum recto-vesicale, may be mentioned, in which three normal, easy deliveries occurred; and as an instance of uterus bicornis septus, vagina septa, I can cite the case observed by myself, in which the first labor was easy and normal, following a normal pregnancy, the left half appearing to have been impregnated; the second, apparently in the right horn, was somewhat delayed and the child died from pressure on the cord. A. Pribram observed a normal delivery in a case of uterus simplex with vagina septa. Three normal deliveries took place in the case of uterus septus which H. Meyer published; in the fourth pregnancy, partus immaturus occurred after a metrorrhagia. F. Henderson

FIG. 123.



Uterus bicornis bicollis, vagina septa. Right horn impregnated. Salpingitis dextra (see "Pathologie de weibl. Sexualorgane," by the author. Plate XXV, page 394).

has seen a patient with uterus partim septus infrasimplex pass through seven normal deliveries. In the case of a IXpara with a uterus bicornis septus, vagina simplex (74), reported by Baart de la Faille, the patient had passed through three normal pregnancies and deliveries, but had five abnormal labors; twice she aborted, once she had a mole with atresia orificii ut. externi, and once it became necessary to peel off the placenta. These experiences, taken together, go to show that the normal development of the ovum and its delivery proceed more frequently with some disturbance than without it, where the soft parts of the parturient canal are faultily developed.

Treatment.—Pregnancy in one atretic rudimentary horn of the uterus must be treated exactly like a tubal pregnancy; that is to say, the fœtus is to be killed with injections of morphine at any time from the second to the fifth month. If this time has passed, we must wait and eventually perform laparotomy with subsequent hysterectomy, as was done by Köberlé, Wiener, Galle-Fritsch and Angus Macdonald. It has already been stated, that the Porro operation is indicated in inguinal hernia of the gravid uterus in case reposition and the induction of abortion fail.

In reference to the faulty presentations of the child, it should be added that every attempt to convert the face presentation into a vertex is contraindicated where the anomaly is due to a uterus bicornis or unicornis. The following caution is not superfluous in the treatment of transverse presentations and the manipulations which become necessary during the detachment of the placenta. Special care should be taken, in introducing the hand, in turning the child and in detaching the placenta, lest the thin walls of the uterus be lacerated. On the other hand it would be advisable, in normal longitudinal positions and a thin-walled uterus, not to increase the short and slightly effective pains by oxytocics, but to extract the child as soon as all the necessary conditions are fulfilled, as a timely prevention of lesions of the uterus.

Any septum present is to be cut only when it actually forms some obstacle to delivery. Lukowitz was compelled to do this with a septum 6 cm. broad, on which the breech was astride; Liebman also did the same with a complete vaginal septum, as did also von Langsdorff and the author with a vaginal septum which was stretched transversely before the head. For this purpose, after thoroughly disinfecting the vagina with a $\frac{1}{10}$ per cent. sublimate solution, the septum is doubly ligated with aseptic silk ligatures and the incision is then made between them with the scissors or the knife. Although these precautions were most carefully observed in the case of septum of the external os uteri reported by me, the puerpera had considerable fever for some days; although, as she had some fever before the operation, she had most probably been infected before. She recovered, however, without any exudation. In such cases it is advisable to irrigate the uterus and vagina with a 3-per-cent. carbolic solution immediately after the delivery, on account of the extensive lacerations possibly present; to increase the uterine contraction by a hypodermic injection of 0.05 gm. of ergotin; and finally to guard against any inflammatory processes by the application of an ice-bladder to the abdomen.

CHAPTER IV.

Disturbances of Labor due to Muscular Neoplasms of the Uterus.

LITERATURE.

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We have frequently found it necessary to refer to myomata as the causes of various disturbances of the puerperal state; we will now seek to embody this scattered material into one collective picture. It is, first of all, worthy of remark, that these tumors, though very common, are by no means frequent causes of dystocia. One of my pupils, Dr. Süsserott, in spite of his careful researches, extending up to the year 1870, succeeded in collecting only 147 cases of this anomaly of labor from the literature of the subject, and Schatz met with it only twenty-four times among 17,900 labors at the Berlin Clinic, during nine years; while any busy gynecologist, in his private practice alone, may meet just as many cases in the non-pregnant uterus in a few years. It is not without interest to give some closer attention to this marked difference. Its explanation is not especially difficult. In the first place, in many cases small tumors of this kind are not recognized during delivery; many times they are first discovered accidentally during the puerperium, when the uterus can be readily palpated on all sides, and no further attention is paid to them because they have not produced any anomaly of labor. Besides, myomata are also a frequent cause of sterility and abortion, for reasons which need not be discussed here, and they develop most frequently at a time of life when the period of greatest fecundity is past, viz., after the thirty-fifth year. Their rudiments in the uterine wall were probably present before, and their growth, as it were, takes the place of an additional pregnancy. The fact, however, remains that I have seen among 15,000 to 16,000 labors scarcely more than five or six cases, in women between twenty and thirty-five years of age, in which these tumors had reached a sufficiently large size to be recognized as obstacles to delivery; this corresponds with the statistics of Süsserot. From this fact two deductions are to be drawn, which I shall endeavor to explain at greater length. First: Although myomata are doubtless much more frequent in pregnant women than is commonly supposed, marked disturbances of pregnancy and labor due to their presence are relatively rare. Second: Their growth is not always rapid, and even during pregnancy does not usually reach an excessive degree.

In regard to the first of these conclusions, the results of the above mentioned 147 cases appear in sharp contrast; for if we compare them with the anomalies of labor which occur in contracted pelves, we would be forced to admit that they produce much more serious complications than the latter. For example, $\frac{7}{10}$ of all of these cases terminate spontaneously, but only $\frac{4}{10}$ of the former; 5 to 6 per cent. of the parturients with contracted pelvis die during delivery or the puerperal state, but almost 50 per cent. succumb to myoma, and finally, while 33 per cent. of the children are lost from pelvic deformity, 66 per cent. perish in cases of myoma. These figures suffice to prove that these 147 cases have been published merely on account of special conditions and the difficulties which they caused during delivery, and that we must not look upon them as the ordinary representatives of these anomalies of labor.

As an example of the second deduction, I shall cite, first of all, a case of Neugebauer, in which a woman, Ipara, aged 25, at whose first confinement a large, round, hard and heavy myoma was found, gave birth to five full-term living children without any assistance; then again a case of Ostertag: a XIII-para, aged 44, twelve deliveries without any assistance; thirteenth delivery, placenta prævia, version, extraction, detachment of the placenta, death on the fifth day; three or four tumors, the size of a fist and larger, on the external surface of the uterus. The case of Shekleton, in which a growth of the tumor was noted, would furnish the proof that frequent pregnancies do not always cause a marked increase in the growth of such tumors. The patient was a 35-year-old VIpara, at whose second, fourth and fifth deliveries it was necessary to perforate, while five years intervened between the fourth and fifth confinement. It is interesting to note in the collection of Süsserott, that 27 of the 29 primiparæ with myomata had an average age of 33 years and that only 47 pluriparæ and multiparæ are recorded. The exceptionally large number of very old primiparæ, the small number of multiparæ (6) and the low average number of children (2.8 per capita) prove sufficiently that the power of conception is much impaired by myomata—a fact recognized by many authors.

In considering the special effects of myomata on pregnancy, labor and the puerperal state, I have found that any attempt to separate the disturbances caused by them, according to the usual division of these tumors into submucous, intraparietal and subperitoneal, is impracticable. It is plain that a cervical myoma, the size of a fist and intraparietal, will have no other effect on the delivery than would a subperitoneal one of the same size, which is situated in the posterior uterine wall and has entered the small pelvis. Moreover, as a rule several myomata are present at the same time, submucous and intraparietal, or intraparietal and subperitoneal, and any disturbances resulting from these do not always depend on the largest one of them. In reference to the position of the tumors, it can only be stated that, in general, the most dangerous are those which are located in the neighborhood of or in the cervix; that intramural corporeal myomata oftentimes cause anomalous pains, retention of the placenta and hemorrhages, and that the numerous subperitoneal tumors of the upper portions of the uterus are the least dangerous.

Disturbances of the regular course of gestation are quite frequent. These consist of interruption of pregnancy by abortion, of hemorrhage from the genitals—placenta prævia is very frequently found (3.4 per cent.), of difficulty in micturition and defecation (Case 57 of *Lorimer*). The latter may become as severe as in retroflexion of the gravid uterus, and is not infrequently repeated in succeeding pregnancies (*Sims*, *Grimsdale*, *Osiander*, *Walter*, *Lehman*). To the same class belong, also, the unusual distention and stretching of the abdomen, œdema, fever and vomiting (*Schnyder*), peri-peritonitic symptoms (*Hall Davis*). The rapid increase in size of myomata during pregnancy, which in some cases is marked, and at times leads to abortion (cases of *Tissier*, *Walter* and others) and to dangerous complications, is said, according to Doléris, not to be due to a hyperplasia of the muscular elements, but to a proliferation of the connective tissue and a tendency to colloid or myxomatous transformation; this is especially the case with pedunculated tumors around the cervix, less so with interstitial myomata. The lymph vessels also exhibit a remarkable tendency to dilatation into lacunæ; the tissues surrounding them become excessively infiltrated with colloid material, and contribute materially to the dilatation of the lymph vessels, inasmuch as the colloid masses mix with the lymph. The increased susceptibility to infection during labor and the puerperium is thereby explained, according to some authors. Their diminution during the puerperium results from absorption and the conversion of the recent connective tissue into cicatricial tissue.

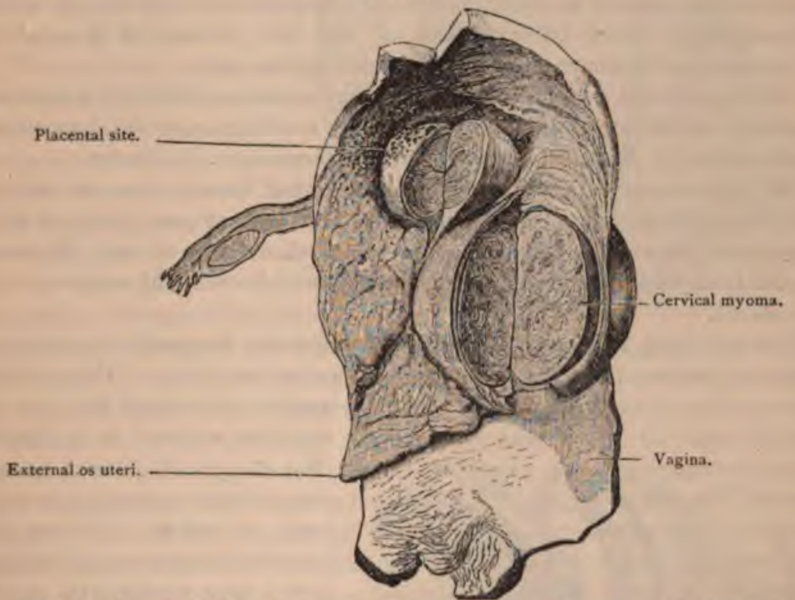
The very frequent occurrence of unusual and faulty fœtal presentations shows that the change in the shape and position of the uterus, which is caused by these tumors, plays an important part in the production of the anomalies of labor: vertex presentations occur in only 59 per cent. of the cases, 36 per cent. less often than usual; Lüdicke and Kornfeld have observed face presentations in cases of myoma. Pelvic presentations are almost eight times more frequent than usual (23.5 per cent.), and transverse presentations occur in 17.5 per cent., or 35 times oftener than ordinarily. For the same reason prolapse of the extremities (4.7 per cent.) and of the cord (6.8 per cent.) is also more frequently met with. It is self-evident that anomalous pains of the most manifold varieties must be present in cases of uterine myomata; for the larger and smaller intramural tumors above the lesser pelvis will arrest the progress of the contraction. These sometimes cause inefficient pains of the most persistent type, even their almost complete cessation for days at a time (missed labor, case of *Sänger*); the entrance of air, death and decomposition of the child may result therefrom (case of *Johannovsky*), the gases arising from the decomposition may pass through the pelvic connective tissue under the skin of the thighs, the abdomen and thorax (case of *Doléris*). The large myomata found on the outer surface of the uterus will cause a faulty direction of the force of the pains, and those in the pelvic outlet will produce the same effect as a contracted pelvis. Budin observed tetanic uterine contractions after vain attempts at version in a case of uterine myoma. Finally, such submucous myomata as project far into the uterine cavity may be dragged away from their point of insertion, owing to their displacement by the fœtal parts, and thus cause an impairment of the contractions of the uterus.

A spontaneous enucleation of such deep-seated tumors may also occur during or immediately after labor.

Example: A case of Valtorta, in which the firm, hard tumor escaped after the pains had continued for sixteen hours; a living child was then extracted with the forceps.

In the above illustrated case from the Munich collection, the accurate history of which, unfortunately, cannot be ascertained, the mucous membrane at the os was ruptured over the cervical myoma, which was almost as large as a fist; in other words, the expulsion of the tumor had commenced. In a similar case, in which the very hard movable tumor had been forced down between the head and the anterior pelvic wall, Barnes subsequently found lacerations of the bladder in two places, although there had been no operative interference during the delivery.

FIG. 124.



Puerperal uterus, from the Munich collection. Two submucous myomata, the upper one the size of a hen's egg, with a partial attachment of the placenta, the lower one the size of an orange, extending from the cervix to the external os.

The case reported by Lefholz is worthy of remark; there were two spontaneous deliveries of living children in a positively diagnosed second vertex position, although the conjugate was narrowed to five or six centimetres by a cervical fibroid; three times, however, it was necessary to perforate the child in a first vertex position. In all probability the tumor was situated more on the left side.

Myomata not rarely cause lacerations of the uterus which resemble those found with the cicatrices of Cæsarean section, since they are likewise found above the "contraction ring," *e. g.*, in the fundus.

Case of Vollmer: 32-year-old IVpara, death before delivery, a laceration 3 in. long in the fundus, in which a portion of the afterbirth was incarcerated. Tumor the size of a small fœtal head, situated in the left upper part of the uterus; also a case of Bezold, in which the rupture occurred at the placental site.

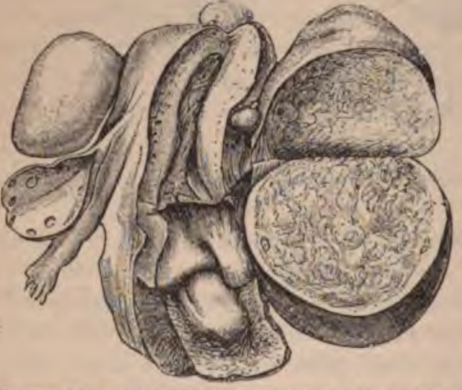
Death occurs much more frequently before delivery, either because assistance is not secured in time (*Bartholin, Chaussier*), or from the operation, for example, during the extraction of the child because of hemorrhage (*de Haen*), or in the removal of the placenta (*Ostertag*).

Contusions and fractures of the fœtal skull occur, as they do in contracted pelvis. I make mention of only those cases in which no artificial assistance was rendered: *Simpson, Boivin-Dugès, Küchenmeister, Chaussier.*

If the tumor is so deeply situated that the head cannot enter the pelvis; if it is so large that even a diminished head cannot pass by it; if it is, moreover, immovable and cannot be reposited, delivery through the small pelvis is impossible, and the woman must die undelivered, unless timely aid is rendered.

In the third stage very serious hemorrhages are frequently observed, so that in one-seventh of the cases the spontaneous expulsion of the placenta cannot be waited for, but its artificial removal is necessary. The danger of a fatal hemorrhage exists especially in those cases in which a part or the whole of the placenta is attached over a large intraparietal or submucous myoma (see Fig. 124), because in that event any attempt to control the hemorrhage by exciting uterine contractions is almost fruitless; only the direct application of styptics can avail anything.

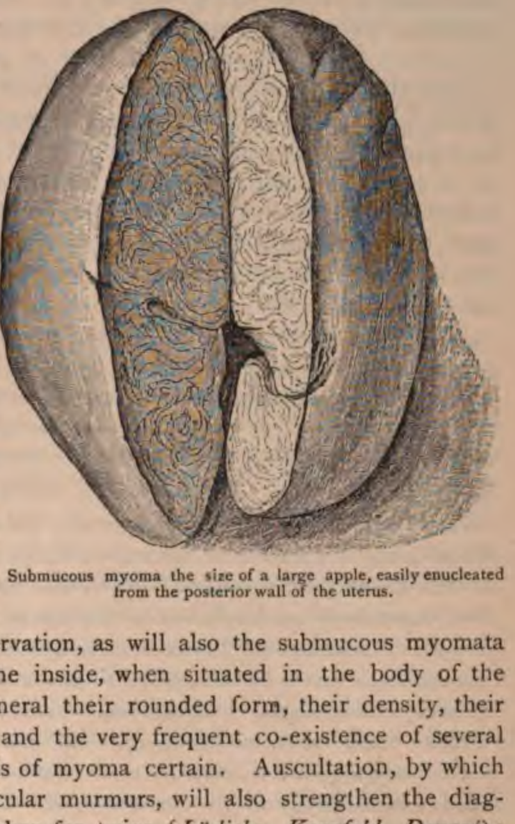
FIG. 125.



Puerperal uterus, from the Munich collection. Five subperitoneal myomata; the largest one on the left is cut open. The puerpera died of pleurisy. (*Hecker.*)

For all these reasons patients with uterine myomata are exposed to many dangers, also during the puerperal state. Some of these dangers are: peritonitis, the result of infection (see Fig. 125), from contusion and suppuration of the tumor with septicæmia; prolonged fever with a necrotic loosening of a portion or the whole of a tumor. The tumor illustrated in Fig. 126 I enucleated with my finger from the posterior wall of the uterus of a puerpera who had been in fever for a long time; after this she rapidly recovered. Sloughing of thrombi, metastatic pyæmia and pulmonary embolism sometimes occur (cases of *Hall Davis*, *Siebold*, *Spiegelberg*, *Düntzer*, *Wagner*, *Keating*).

FIG. 126.



Submucous myoma the size of a large apple, easily enucleated from the posterior wall of the uterus.

The *diagnosis* of myomata in the pregnant uterus, excepting those on the posterior wall, is not difficult; even the smaller tumors can be felt between and upon the muscular fibres, and may very often be seen through the abdominal wall. But tumors like the one we have illustrated under the head of rupture of the uterus, will easily escape observation, as will also the submucous myomata which project only toward the inside, when situated in the body of the uterus (see Fig. 124). In general their rounded form, their density, their firm attachment to the uterus and the very frequent co-existence of several tumors will make the diagnosis of myoma certain. Auscultation, by which we may many times hear vascular murmurs, will also strengthen the diagnosis. They have been mistaken for twins (*Lüdicke*, *Kornfeld*, *Denaré*); also for pieces of placenta, when they have descended low down. If a tumor of this kind is above or in the pelvis, and is an obstacle to the passage of the child, we must ascertain whether it is movable and can be forced higher up. If this be impossible, its consistency must be tested and the width of the passage through the pelvis accurately measured. The question must also be considered, whether the tumor, situated in the pelvis, cannot be removed before delivery by an operation.

The *prognosis*, according to the cases which have been published in the literature up to 1870, may be deduced from the following figures: Of 147 mothers only 69 lived, 53 per cent. died; peritonitis, hemorrhage, exhaustion, metastatic pyæmia were the most frequent causes of death. According to Lafour, of 286 cases 141 died, = 49 per cent.; among 147 cases it was necessary to complete the delivery by operation in 85 (forceps, 20; turn[illegible]g, 20; detachment of the placenta, 21; Cæsarean section, 12; inductio[illegible] of abortion, 8; reposition of the tumor during delivery, 11; removal of [illegible]he tumor during delivery, 7; perforation, 6; extraction with hook, 1). It [illegible]as necessary, therefore, to terminate the delivery artificially in 60 per cent [illegible]of the cases, 6 times as often as usual; only 40 per cent. ended spontaneou[illegible]y. Among these were several which terminated in abortion, or proved f[illegible]al before delivery. Since that time the prognosis will certainly have improv[illegible]; for with the thorough antisepsis which is now universally practiced, the n[illegible]nber of myomatous patients who die of septic processes after delivery [illegible]ill undoubtedly be much smaller, and besides, Cæsarean section has bec[illegible]e much less dangerous. The Porro operation, however, is destined to save [illegible]he lives of many such sufferers, and the prognosis for the children will ther[illegible]by also be improved.

Although, in spite of this, the recent results which have been reported by Stratz [illegible]om Schröder's clinic were no better for the mother—for of 13 parturients with myomata, 7 [illegible] 54 per cent.) of the mothers died—yet 8 (62 per cent.) of the children were born alive. [illegible] 10 cases of myomata treated during pregnancy, four times abortion was noted, three times ind[illegible]ed abortion, twice myomotomy with the removal of the gravid uterus, and once myomot[illegible]y during pregnancy with the birth of a living child at term; none of the mothers died.

Treatment.—If in a pregnant woman, the mother of living children, [illegible]he pelvic cavity is encroached upon by a firmly attached, hard, non-remova[illegible]le myoma, so situated in the small pelvis that the delivery of a fully-develo[illegible]ed child can only be accomplished by mutilating it, or by the Porro operati[illegible]n, or by the Cæsarean section, the induction of abortion may be conside[illegible]ed indicated as soon as the condition of the mother is in any way endange[illegible]ed by fever, hemorrhages, vomiting, etc. I should have thought that these in[illegible]ications were present, for instance, in the case of Wasseige. As an exam[illegible]le of this very urgent indication, I refer to the case of Schnyder, which ter[illegible]inated successfully, and to the unfavorable case of Hall Davis, also to [illegible]e case of Breisky, which terminated favorably in an abortion, and finally [illegible]o the case of Grimsdale. For, as this last case proves, after abortion has be[illegible] accomplished, the tumor may be removed entire or in several sittings, eit[illegible] by electrolysis or by incisions and extirpation, thereby rendering the sub[illegible]quent birth of a full-term child possible. For this reason neither the Cæ[illegible]rean nor the Porro operation is indicated in such cases.

The induction of premature labor would be indicated if sufficient ro[illegible] still remained alongside of the tumor in the pelvis to permit the delivery [illegible] a living viable child. The conjugate should under no circumstances [illegible] below 6.5 cm. Ashwell operated under this indication, but was compell[illegible] to terminate the delivery with the hook, the child being situated in t[illegible] second breech position.

If the patient is already in labor, the tumor which is low down should [illegible] reposited if possible; in many cases this has been done successfully. Reposition may be done under chloroform in the lateral prone, or the dorsal, or the knee-chest position; it should be followed, if all other conditions are favorable, by forcing down the head into the pelvic inlet, or by version and bringing down the breech (cases of *Ashwell*, *C. Mayer*, *Späth*, *Pillore*, *Bompiani*).

When reposition is impossible and the tumor is situated low down, we must first of all think of its diminution or its removal during the delivery. This applies not alone to those tumors which are drawn out into a long pedicle, but also to those which are spread out broadly upon or are situated in one of the lips of the cervix. Danyau and Heck, Depaul (see above) and Blot (see above under Depaul), and Farrant-Fry did this successfully; the removal was successful in another case of Cazeaux and Danyau.

Version would be indicated when the head is high up and the pelvis so roomy that the child can be brought through without being mutilated, in case hemorrhage or prolapse of the cord or any other complication call for immediate interference. If the child is dead, perforation and extraction with the cranioclast would be indicated.

Finally, when an absolute pelvic contraction (under 5.5 cm.) is caused by an immovable myoma, the Cæsarean section should be performed according to Sänger's method, provided only this one tumor be present; if several tumors coexist in the body of the uterus, Porro's operation would be, by all means, the best, since the preservation of the much-diseased uterus has no advantage. Fochier (see above) operated successfully under these conditions.

After any operation performed on the pregnant myomatous uterus, the arrest of the hemorrhage and the expulsion of the placenta will have to be most carefully attended to; if the hemorrhage is profuse and does not speedily cease with the contraction of the uterus, for the reasons already mentioned, it will eventually have to be checked by local application of liquor ferri sesquichloridi (injection or tampons). The hypodermatic use of ergotin 0.05 : 1 gm. several times a day is indicated during the first part of the puerperium. If the tumors sink toward the inner surface of the uterus, they should be removed as early as possible, so as to prevent suppuration, thrombosis and pyæmia.

CHAPTER V.

Disturbances of Labor Resulting from Carcinomatous Degeneration of the Uterus.

LITERATURE.

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While we were compelled to notice the rarity with which myomata cause dystocia, we find that carcinomatous degeneration of the pregnant uterus occurs still less frequently, scarcely half as often as the former, not excluding accidents. I observed only three cases of this kind among 12,000 labors in Dresden, while in Munich five cases among 3000 deliveries have been met—almost seven times as many; altogether 8 : 15,000. Stratz, in a total of 17,900 labors, observed five in pregnant and seven in parturient women. We must, therefore, coincide with the statement of Gusserow and Stratz, as opposed to that of Cohnstein, that carcinoma must prove a decided obstacle to conception, because it occurs so very seldom during gestation. In comparison with myomata this is easily explained, for the latter spring almost without exception from the body of the uterus and only hinder the entrance of the spermatozoa into the uterine cavity to a slight degree; while carcinoma, which almost constantly starts from the cervix, must form a mechanical obstacle, besides directly destroying the spermatozoa by its profuse discharge, or at least washing them away. It is still doubtful whether the papillary epithelioma, which arises from the surface of the lips of the cervix where covered with pavement epithelium (especially if it originates in only one lip), is more favorable to conception; in the later months of pregnancy it is hard to distinguish the forms from one another, particularly as the growth of the tumor is often rapid.

Among the 127 cases collected by Cohnstein, only twenty-one extended beyond the internal os, six affected the entire uterus. Vagina, bladder and rectum are very frequently extensively involved.

The first symptoms are an almost continuous bloody discharge, moderate or profuse in amount, associated with pains in the abdomen and back. In some cases these hemorrhages first appear toward the end of pregnancy, having been preceded by a more or less profuse leucorrhœa. If the disease is circumscribed and confined for the most part to one lip alone, pregnancy may continue to term; if it is more extensive, if the destruction is more rapid and profound, and if the loss of blood is considerable, a premature interruption of pregnancy occurs, as a result of the loss of fluids or of other accidental diseases. Among nine cases of mine this happened five times, in three of them probably by accident, in cases suffering from papillary epithelioma. In Cohnstein's collection 29 per cent. of the labors were premature. Gusserow and Felsenreich correctly point out that abortion is most frequent in cases where the disease extends high up.

In the milder forms of the disease premature delivery does not occur much more frequently than usual; the contractions are more painful, the loss of blood greater, and in the puerperium there are days in which the abdominal pains are more severe and moderately high fever is present.

Where the disease is confined to one lip, not alone may pregnancy go to term, but the course of the delivery may be perfectly normal in regard to its duration, mechanism, condition of the fœtal sac, caput succedaneum and the expulsion of the placenta; in other words, no interference is called for. I observed such a case in June, 1884.

A 35-year old IXpara. First stage, forty-three hours. Head presentation, spontaneous delivery of a macerated boy 48 cm. long, weight 2550 gm. Papillary epithelioma.

Unfortunately, such cases are rare exceptions; as a rule, the course of labor is far more unfavorable: the pains are often very weak and slow and intermit for days, and then all of a sudden grow forcible; the parturient becomes feverish and the discharge sanious; the child dies, and as a result of perforation of the anterior and posterior vaginal fornix, the most acute form of sepsis is set up, with peritonitis and death during labor.

If the neoplasm is more extensive and the tumor harder, the dilatation of the cervix is extremely difficult in spite of strong pains, the delivery does not advance for hours, and finally it becomes necessary to perforate the fœtus and to extract with the cranioclast. The result is that numerous lacerations occur into the new growth, extending even into the adjoining organs (bladder).

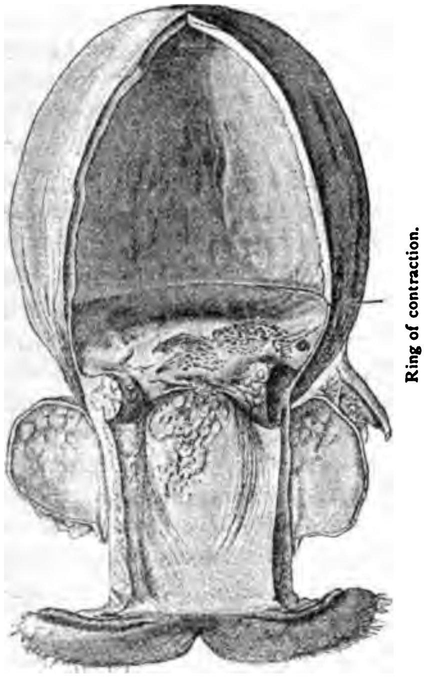
A 42-year old IXpara. Carcinoma of the cervix and vagina. Child, without the brain and parietal bones, weighed 2450 gm. The laceration into the bladder was sutured and healed up, except a small fistula.

An especially interesting accident, likely to take place in such parturients, must be considered here, viz., the gradual occurrence of air-embolism as the cause of sudden death during labor. The one interesting case of this kind which I saw was a 29-year old VIpara, in whom the macerated hydrocephalic head of a fully developed child, pressed like a piston into the rigid cervical canal, had, by its to-and-fro movements (due to the patient's rapid tossing from one side to the other), led to the aspiration and forcing of air into the numerous gaping veins of the cervix. I found the air, in a state of minute emulsion, distributed as far as the vessels of the brain. The carcinomatous degeneration of the cervix and the numerous openings of the veins are well shown in Fig. 127.

Since many of the deliveries in cases of cancer are immature and premature, we frequently find pelvic presentations of the children; on the other hand, in spite of the cancer, head presentations occur with the usual frequency in full-term children. Cases have also been observed in which the cancer was so firm and extensive that delivery by the natural passages was entirely out of the question, and the Cæsarean section became necessary.

The placenta must be expressed oftener than usual, on account of excessive hemorrhage after the complete delivery of the child, otherwise its expulsion is seldom rendered more difficult.

FIG. 127.



Carcinoma fibrosum of the vagina and cervix of the gravid uterus. Numerous venous openings of the cervix (see also Figs. 21 and 22).

The *diagnosis* of cancer of the uterus in pregnant women is rendered positive if a hard, tuberculated, tender and at times crumbling condition of the cervical lips coexist with the bloody or ichorous discharge; the microscopic examination will confirm the diagnosis by the discovery of a typical epithelial proliferation. The appearance of such patients is by no means always cachectic, they often show only a moderate degree of anæmia. These growths may be confounded with abundant pointed condylomata of the vault of the vagina and the portio vaginalis, also with sloughing myomata of the cervix or pedunculated myomata which have been forced down, and finally with the discharge of decomposing fragments of the fœtus after an abortion. The more careful observation, the microscopical examination which reveals in the latter chorionic villi and decidua, in the former typical papillary growth, and the result of the removal of these masses quickly decide whether the neoplasm is benign or malignant.

The *prognosis* of cancer of the uterus in pregnant women is bad. According to the statistics of Cohnstein, 72 out of 126 such cases or 57 per cent. died, only 43 per cent. survived the puerperium. The most frequent causes of death were peritonitis, rupture of the uterus, septic infection and metastatic carcinoma; in twenty cases these were grouped as follows.

There died—

From cancerous cachexia, cancer of the stomach, cancer of the pleura, each 1 = . .	3
" exhaustion, ...	3
" peritonitis or puerperal fever, ...	4
" rupture of the uterus, ...	10
	—
	20

My experience agrees almost exactly with this; for out of 9 five = 55.5 per cent. died, 45.5 per cent. remained alive. There died—

2 undelivered { 1 of acute sepsis.
                          1 of air embolism.
1 of hemorrhage after placenta prævia, 1 hour post partum.
1 of sepsis after its manual extraction on the 7th day post partum.
1 of perforation-peritonitis on the 10th day.

Still sadder is the result for the children; for of these nine, four were fully developed, three of whom were already in a macerated state, yet not one of the whole number lived beyond a few days. If Gönner observed four living children born in six cases and lost only one mother, his patients must have been affected with a mild form of the disease. Stratz, also, in five pregnant women of this type, had no fatal case (once abortion, four times supra-vaginal amputation, followed three times by abortion). Of his seven parturient women with cancer, however, 4 = 57 per cent. died immediately after labor, and two more as a consequence of the delivery and the rapid growth of the cancer in the puerperium, altogether 85 per cent. Two of the children were saved, four were born alive (two spontaneous deliveries, two Cæsarean sections, two versions and one forceps).

The great rapidity with which carcinoma grows during the puerperal state is especially well shown in the last case which was observed by me. On the 28th of June, the day of the admission of the patient (an XIpara in the seventh month), the disease appeared to be confined wholly to the anterior lip and wall of the cervix; four weeks later the uterus was so firmly fixed that a supra-vaginal amputation was impossible.

Treatment.—"In cases of this complication," Stratz says, "the uniform principle of treatment which governs all surgeons is, to operate as quickly as possible where the cancer admits of operation, and to give the first attention to the child's life where an operation is unjustifiable." This dictum is both too narrow and too broad; too narrow for the treatment of pregnancy complicated with uterine carcinoma, since, if Stratz himself produced an abortion three times during pregnancy by performing four supra-vaginal amputations of the uterus, he thus sacrificed the fœtal life to that of the mother, because the cancer admitted of operation. Why should we not proceed in the same way when the cancer is unsuitable for operation? Experience teaches us that premature labor occurs most frequently without any operation; in other words, that there is little hope for the child; the mother, however, is placed in less danger by the expulsion of a smaller fœtus and her life may be preserved for a longer period. Gönner's experience coincides with my own on this question. I, like Felsenreich, am, indeed, in favor of the induction of abortion or premature labor, when the gravida comes under our care only after the seventh month, regardless of the child's life, and I should select rupturing the membranes as the most certain and least dangerous procedure. If the disease be still confined to the uterus, subsequent total extirpation of the organ would be indicated.

Should it be possible to remove the tumor completely during pregnancy, it may be attempted either with the knife or the thermo-cautery. Nevertheless, premature delivery will probably occur, as I have myself witnessed in two cases.

If labor has commenced, the strictest antiseptic precautions must be observed, hemorrhage controlled, the membranes kept intact as long as possible, vaginal injections of a solution of boric acid or permanganate of potassium or of corrosive sublimate given, and, in case of necessity, unyielding parts must be incised. Should it be possible to remove large masses of the neoplasm, this must be done during labor, with the spoon or knife or galvano-caustic loop, in order to make room; subsequently, immediately after the delivery, the radical operation can be performed (successful case of Felsenreich); if the fœtus be dead we must perforate early and extract slowly. The question still remains, in case the fœtus be living, whether a Cæsarean section should be performed when the extraction of a mutilated child is possible; or whether it would not be more humane under such circumstances to perforate the living child. I incline to the latter opinion, and would have done so in the case cited above, if the fœtus had not died one hour before the operation. Who could guarantee that the child, extracted alive, will live for a week? The cases of Zweifel (1) and of Stratz (2) teach us, that the prognosis of a Cæsarean section, performed in a carcinomatous uterus, is much worse than in the case of a healthy uterus, in spite of all antiseptic precautions; while the mother may continue to live for months, even a year or more, with a cancer which does not admit of an operation.

For these reasons, I consider the statement of Stratz too broad, *i. e.*, too much value is attached to the child's life alone. And I believe that no father would give his consent to the Cæsarean section, if he knew that in such cases the mother often succumbs very rapidly after the operation done solely for the benefit of a child, whose future existence is very doubtful. Certainly, to him the maternal life is far more precious, even though it is presumably only a question of weeks or months.

It is different when an absolute indication for the operation is present; of course, we shall then proceed as rapidly as possible, in order to save the child, and in the event of the death of the latter, perform a laparo-hysterotomy, so as to leave no means for saving the mother neglected; in such cases I believe, with Felsenreich, that the preference should be given to the Porro operation over the classical Cæsarean section.

CHAPTER VI.

Disturbances of Labor due to Atresia and Adhesion, Stenosis, Rigidity and Swelling of the Cervix, the Vagina and Vulva.

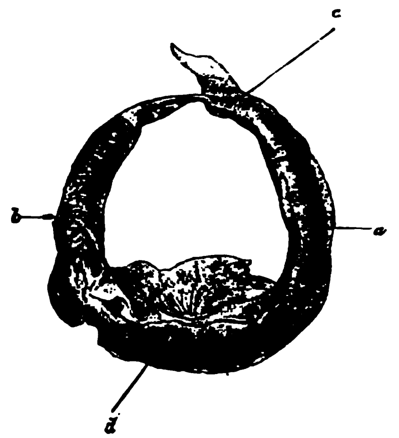
1. *Atresia and Adhesion of the External Os uteri. Conglutinatio et atresia orificii uteri externi.*

LITERATURE.

Ahlfeld: "Berichte und Arbeiten," Marburg, II, 132. Barbéra, Marti F.: *Progresso ginec.*, Valencia, 1884, I, 225. Brown: *Brit. Med. Jour.*, 1886, I, 928. Bucquet: *Progrès Méd.*, 1883, XI, 55. Chadwick, J. R.: *Obstetr. Gaz.*, Cincinnati, 1886, IX, 366. Charles, N.: *Jour. d'accouch. de Liège*, 1886, VII, 145. Chiara (Florence): *Annali di ostetricia*, February, 1883. Cross (Little Rock): *Amer. Jour. of Obstetr.*, August, 1883, 809. Von Dietrich, J.; "Fall von Atresia Uteri Gravidi," *Petersburg. Med. Wochenschrift*, 1878, No. 10 (not atresia, but excessive stenosis). Doléris: *Archives de tocologie*, No. 11, II, 1886 (stenosis vaginæ congenita). Dumouly: *Gaz. de gynéc.*, Paris, 1885–86, I, 54. Hyernaux: "Bull. de l'academie royale de méd. de Belgique, 1882, No. 8. Janvrin: *Amer. Jour. of Obstetr.*, October, 1880. Ireland, J. A.: *Med. Herald*, Louisville, 1884–85, VI, 4. Löhlein: "Zur Lehre von der Conglutinatio orificii uteri externi," *Zeitschr. für Geburtsh. und Gynäk.*, Bd. I. MacMullen: *Australas. Med. Gaz.*, Sydney, 1885-86, V, 90. Mansell-Moullin: *Brit. Med. Jour.*, February 17, 1883, 309. Padley, G.: *Brit. Med. Jour.*, March 10, 1883, 454. Von Rabenau: *Centralbl. für Gynäk.*, 1883, VII, 108. Smith, Thomas C.: *Amer. Jour. of Obstetr.*, May, 1884, 473. Steger, A.: "Atresia uteri als Geburtshinderniss," *Correspondenzblatt für Schweizer Aerzte*, 1877, No. 2, 43. Vince and Perauchaud: *Gaz. méd. de Nantes*, 1885–86, IV, 122. Waxham: *Maryland Med. Jour.*, Baltimore, 1886, XV, 265. Welponer, E.: "Beiträge zur Casuistik der durch Anomalien der weichen Geburtswege bedingten Geburtsstörungen," *Wiener med. Presse*, 1880, Nos. 22–24. Wyder: "Geburt bei Atresie der Scheide und Blasenscheidenfistel," *Centralbl. für Gynäk.*, 1885, IX, 96.

Closure of the external os uteri occurs in young and old primiparæ and in pluriparæ and multiparæ, where, as a result of catarrh or injury of the epithelium, denuded portions of the lips of the cervix lie in apposition. At first the adhesion (agglutination) is effected by the secretion, into which colorless blood-corpuscles emigrate; vessels, connective tissue and muscles are then formed, and the newly-formed adhesion quickly acquires a certain resistance, thickness and consistency. Even when the adhesion consists of little more than delicate epithelium or connective tissue, it may form a decided obstruction during delivery, inasmuch as it makes it impossible for the membranes to enter the occluded os. Löhlein calls attention to the not infrequent firm adhesion, in such cases, of the membranes to the endometrium as a cause of the difficulty with which the ovisac enters the cervix. As the lower uterine segment becomes thinner, the contractions become more painful, until finally the membranes yield and the delivery is then rapidly terminated. If, on the contrary, the adhesion is a firm, thick, unyielding one, and if timely assistance is not at hand, the portion surrounding the cervix may be torn off by the ever-increasing pains and may be expelled in front of the fœtal part (Fig. 128); under some circumstances the rupture may be more extensive and the patient die undelivered.

FIG. 128.



External os uteri, *a*, *b*, *c*, *d*, and a portion of the cervix, *d*, torn off during the delivery.

The recognition of the adhesion (conglutinatio) and the atresia was easy in all of the cases which came under my observation. The natural opening of the cervix is absent, and in place of it a smooth depression, surrounded by a low eminence, is felt, through which the presenting fœtal part can be more or less plainly palpated; no fœtal membranes present, although none of the liquor amnii has escaped and the pains have been active for many hours. Above all else, however, it is impossible to enter the cervix or separate it from the presenting part. These are conditions which can leave no doubt of the existence of atresia of the external os.

The *treatment* is usually simple. As a rule, it is possible to tear the still yielding membrane by pressure upon and into it, and then to enlarge the opening with the finger or a uterine dilator, when the membranes will descend and rapidly continue the dilatation. If this fail, we may sometimes bore through the obstruction with the sound (Case 2 of Smith), otherwise we must expose the lower portion of the womb with a speculum, fix the cervix with tenacula, and having thoroughly disinfected it with a 3-per-cent solution of carbolic acid, with or without previous applications of a 4-per-cent. cocaine solution, make a superficial crucial incision through the membrane, and if necessary, remove the points of these flaps. Welponer and I have operated in this manner. In this proceeding we can see accurately whether any vessels are injured and need to be tied, and can more certainly prevent infection than if we make the incision with a guarded scalpel introduced along the index finger of the left hand without the aid of the eye. The antiseptic injection is to be repeated immediately after the opening has been made.

It is an entirely different affair if a complete or almost total atresia of the cervix exists in a pregnancy, as a sequel of a previous difficult confinement in a contracted pelvis, followed by extensive ulcerations with stenoses of the cervix and the vault of the vagina. If the pelvic contraction is not under the first or second degree, it is better to employ in such cases methodical dilatation with incisions and tampons at the end of pregnancy, similar to those Nathan Bozeman has recommended in the preparatory treatment for the cure of vesico-vaginal fistulæ which are difficult of access. The colpeurynter, covered with iodoform ointment, will also be found of some service in these cases. Smellie (1764) had already availed himself of modern dilators which he had specially constructed; and he made, besides, numerous ample incisions. If the cicatricial tissue, however, does not yield, or if the pelvic deformity is such that the child would certainly be lost, and the mother's life greatly endangered, then the Cæsarean section is called for, and has been performed successfully for mother and child by Dr. Weiss (*Archiv f. Gynäk.*, XXVIII, 89).

If the atresia is situated lower down in the vagina, and the pelvis is not contracted, and if the parturient is in the first stage of labor, we may, after emptying the bladder and rectum, bore through the occluded portion with a trocar passed along the index finger of the left hand, which has been introduced into the rectum, and then dilate the opening sideways, whereby we can certainly avoid any laceration of the bladder and rectum. The larger bleeding vessels are ligated. If the presenting fœtal part were already closely behind the obstruction, and had forced it well forward, after having mapped out the locality of the bladder with a catheter, and of the rectum with the finger, we might begin a transverse superficial incision at the point where the presenting part could be most plainly felt between these two organs, until we come directly upon it, and then enlarge the incision according to the size of the fœtal part.

In atresia of the hymen, such as is said to have been present in a case of Hyernaux, it suffices to make a simple vertical or crucial incision.

After the completion of the delivery, the parts must be most thoroughly disinfected and the large bleeding vessels ligated. Then an iodoform gauze tampon may be introduced and left for twelve hours. If the incision has extended, the tears must be reunited with catgut after smoothing off their edges. Irrigation during the lying-in period is usually unnecessary.

2. *Stenoses, Abnormal Rigidity, and Swelling of the Soft Parts, as Causes of Disturbances of Labor. Stenoses, rigiditates et intumescentiæ genitalium.*

Causes of stenosis are either defective development in general, for example, with uterus bicornis or vagina septa (case of *Doléris*: a very fine opening in a congenital transverse septum vaginæ), or cicatrices, especially those due to lacerations which occur during delivery (case of *Mansell-Moulin*), or strictures arising from ulcerative processes—septic, syphilitic infection (case of *Welponer*)—or in consequence of plastic operations (for prolapse, perineorrhaphy), Emmet's operation (*Janvrin*), or of the use of severe caustics, as the hot iron (*Dumouly*), or the galvano-caustic loop (case of *Welponer*). Even after spontaneous or instrumental deliveries in which vesico-vaginal fistulæ are produced, the vagina may become so cartilaginous, hard and contracted, as a result of the trauma and the continuous dribbling of urine, that barely a sound can be introduced. Impregnation may take place nevertheless, either through this fine opening (*Winckel*: "Krankheiten der weiblichen Blase," second edit.; also *Padley* and *Cross*), or by cohabitation per urethram (case of *Wyder*). Swellings may arise as a result of œdema from pressure in a contracted pelvis, and also from cicatrices, in anæmic dropsical individuals, and finally in conjunction with infected ulcers.

The cervix, vagina and vulva may be too tense, hard and unyielding, when morbid changes are present, for example, carcinoma, infiltration or chronic inflammatory processes, hypertrophy of the portio vaginalis (case of *Welponer:* Hypertrophy of the portio vaginalis media, and of *Fleischmann* [*Prager med. Wochenschrift*, 1885, Bd. x, page 343]), or when the natural elasticity of these parts is impaired, as in an advanced age of the parturient (35–44-year-old primiparæ). In more recent times Dreyer (1883), Charpentier (1886), and Polden (1887) have reported cases where the hymen constituted an obstacle to delivery. The results of such anomalies of the tissues are delays in the delivery, painful contractions and more or less deep lacerations of the narrow or unyielding parts, with subsequent hemorrhages.

After Hegar's operation for prolapse, which I had performed, the vault of the vagina was so narrowed by an anterior and posterior colporrhaphy that it was necessary to apply the forceps at the subsequent confinement, because the child's life was endangered. At the same time the right side of the vault of the vagina was torn for a distance of 4 cm. between the vaginal cicatrices; four sutures were inserted and a speedy recovery ensued.

Sometimes fragments of the uterus or the vagina are torn off, lacerations of the recto-vaginal septum or vesico-vaginal fistulæ occur, or even a central laceration of the perineum is produced, through which unnatural opening the child is born. Too tense a hymen is also to be enlarged by various equidistant incisions, in the same way as a too rigid perineum is incised. The child suffers by the greater compression and the prolonged delivery in the same manner as it does in contracted pelves, and may die in consequence. The danger for the mother in the puerperium is a greater one owing to the extensive lacerations, in which the lochial secretion lodges, and during subsequent confinements the residuary cicatrices and stenoses produce still greater obstructions (see the above cited case of Weiss).

Treatment.—The treatment must be chiefly local and consists of injections of mucilaginous fluids (milk, decoctions of marsh-mallow, flaxseed), or mildly sedative ones (fol. laurocerasi, fol. hyoscyami, 15 : 1000), repeated every hour. The colpeurynter acts more surely and rapidly, yet it stimulates the pains to a greater degree, and, therefore, acts often too strongly. If the stenosis or rigidity is too firm, incisions ½–1 cm. in depth are to be made at various points with Cooper's scissors, and the dilatation repeated. Such incisions, like those which are made into the external genitals, have been objected to on the ground that they may extend into deeper and more dangerous lacerations. I have never yet had this experience, and, even if they should occur, they are not so bad as the destruction of tissue which is often seen in spontaneous lacerations of these parts without any incisions. Deep lacerations are, of course, to be reunited with sutures.

In œdema of the vagina and vulva, we should endeavor to diminish the swelling by scarification, to protect the perineum with special care, and under these conditions several small incisions on the posterior commissure should certainly be made. In central lacerations of the perineum the remaining septum should be divided so as to prevent their extension through the rectum. Any fistulæ that are formed and isolated deep lacerations of the lips of the cervix and vagina, can, with the aid of a speculum, be united just as certainly immediately after the delivery and be made to heal just as well as they can several weeks later.

3. Neoplasms of the Vagina as Obstacles of Labor.

(A) Connective-tissue and muscular tumors.

LITERATURE.

Kleinwächter: "Die bindegewebigen und myomatösen Neubildungen der Vagina," *Prager Zeitschr. f. Heilkunde*, Bd. III, p. 335, 1882.

Connective-tissue and muscular tumors are found in all parts of the vagina in the form of pure fibromata, fibro-myomata, and pure myomata, situated preferably on the anterior wall. It is worthy of remark that they are always single, that they are sessile or pedunculated with equal frequency, and that they are seldom associated with other tumors of the genitals. In general the menses and conception are seldom interfered with by such tumors, so long as they are not excessively large. Pregnancy and labor also pursue for the most a normal course. M'Clintock found a pedunculated myoma the size of a hen's egg, which was partially gangrenous, in a pregnant woman in the last month. The delivery is delayed in the case of medium-sized tumors; if the neoplasm is situated low down, it may be pressed out by the presenting fœtal part, which is then born. A case of Porro proves that compression and bruising of the tumor may occur and be followed by gangrene. Still larger tumors may so block up the pelvis that the Cæsarean section becomes necessary. Pillore (*Gazette des hôpit.*, No. 137, 1854) performed a laparohysterotomy in the case of an immovable fibroid tumor, 16 cm. long, 10 cm. broad and 9 cm. thick, situated in the recto-vaginal septum. It is certain that these tumors, especially those which are very vascular, may diminish spontaneously during the puerperal state.

The *diagnosis* of the variety of tumor is easy; it could only be confounded with a cyst when it is very œdematous. It is more important that its situation should be accurately established, and that it be not taken for granted that every tumor which is found in the vagina springs from the vaginal wall. The upper boundary of these tumors must be exactly defined, since several cases from among those collected by Kleinwächter appear probably to have sprung from the uterus and not from the vaginal wall, among which may be mentioned those of Denys, Simon, Baudier, Van Dœveren and Gensoul.

Treatment.—Medium-sized tumors, which would be likely to cause some obstruction during labor, may be extirpated during pregnancy. Gremler removed a pedunculated tumor of this kind, weighing 5 kgm., three weeks before the normal end of pregnancy, without premature delivery occurring. (*Preuss. Vereinszeitg.*, Berlin, 1843, XII, No. 33). Movable tumors might also be excised during the delivery, cutting away large pieces with the Paquelin, in order to make room. In the case of very large immovable tumors which could not be sufficiently reduced in size, the Cæsarean section may be performed as a last resort.

(B) Cysts of the Vagina.

Cysts of the vagina may be so large as to offer some obstruction to delivery. The best observed case, although not seen in pregnancy, was that of Höning, in which the tumor, starting from the gland of Bartholin, was the size of a goose egg, and extended as far as the pelvic inlet (*Monatsschrift*, Bd. XXXIV, p. 130). Peters observed a tumor, the size of a child's head, in the posterior wall of the vagina, which obstructed labor, and removed from it a pound of clear yellow fluid; hence, there is a likelihood of confounding such growths with an ovarian cyst (*Monatsschr.*, Bd. XXXIV, p. 2, 1869). Thus in Paul's case, the tumor, which was the size of a pear, was probably an ovarian, and not a vaginal cyst; the extraction of the head with the forceps was only possible after the removal of the tumor (*Preuss. Medicinalzeitung*, 1861, No. 28).

(C) Hydatid Cysts in the pelvic connective tissue as obstacles to delivery.

LITERATURE.

Pinard: *J. des sages-femmes*, Paris, 1887, XV, 249. "Dystocie produite par la présence d'un kyste hydatique remplissant l'excavation du bassin. Tumeurs multiples; ponction; infection puerpérale; mort de la mère." Wiener: *Archiv f. Gynäk.*, XI, 572, containing the Literature. Winckel: "Path. d. weibl, Sexualorgane," I, 194. Tafel, XXIV.

Up to date nine cases of this kind have been reported by Davaine, Blot, Roux, Puchelt, Birnbaum, Sadler, Wiener, Küchenmeister-Winckel and

Pinard. Nearly all of the tumors lay between the vagina and rectum; fluctuation and hydatid thrill have scarcely ever been observed in them, because the pressure to which the tumors are subjected in parturition has been very great. The chief symptoms were disturbances of the bladder and rectum.

In the case which I observed, there were four colonies on the posterior wall of the uterus, another in Douglas' cul-de-sac, the size of a hen's egg, with dense cyst walls, and a conglomerate mass, the size of an apple, in the left ligamentum latum; the conjugate and the transverse diameters were thereby contracted 4–5 cm. The patient was delivered by me by means of version and retraction, after ineffectual attempts had been made by Küchenmeister to extract with the forceps; she died, however, on the fourth day *post partum*, of rupture of the uterus. The uterine wall was more than 3 cm. thick at the fundus, but as thin as paper below and to the right over the tumor, and here the laceration was found.

The lower part of the uterus is generally displaced high up in front by the tumor; the examination is thereby made very difficult, and it is almost impossible for the head to engage. The patients of Sadler and Puchett were delivered by the Cæsarean section, the tumor having been held to be solid; both of them died very shortly afterward. In the cases of Park, Blot, Birnbaum and Wiener, the delivery was terminated by the use of instruments after the sac had been punctured and reduced in size. The patient of Wiener, alone, died of peritonitis from a laceration of the cervix, as did our patient, only in the latter case puncture would not have caused any satisfactory reduction in the size of the tumors, since many smaller ones were present.

Echinococci of the pelvis should be suspected as the obstacle to delivery, when one or more smooth, elastic and at times somewhat movable tumors, not always attached to the uterus, are found in an individual who is predisposed to such diseases; a positive diagnosis can be arrived at by the hydatid thrill, and by puncture followed by the escape of the daughter cysts.

4. *Other Disturbances of Labor Dependent upon the Soft Parts in the Small Pelvis.*

LITERATURE.

Dodge: "Cystocele." *Peoria Med. Month.*, 1884–85, v, 207. Evans: "Cystocele." *Lancet*, London, 1885, I, 385. Grassl: "Gefüllte Blase." *Münchener Med. Wochenschrift*, 1886, XXXIII, 650. Hugenberger: "Zur Casuistik der Harnblasensteine in der weiblichen Fortpflanzungsperiode." *St. Petersburger med. Zeitschrift*, N. F., Bd. v, Heft 3, 1875. Mari: "Blasenstich." *Med. Raccoglitore*, Forli, 1883, 4 s., XX, 279. Meissner, E. A.: *Monatsschrift für Geburtskunde*, XXI, Supplement, 131–141. Prideaux, P. E.: "On a Case of Cystic Polypus of the Rectum Complicating Parturition." *Lancet*, London, 1883, II, 633. Whitham: "Cystocele." *Brit. Med. Jour.*, 1883, II, 907.

(A) *Retro-uterine Hæmatocele.*—I have several times observed this accident in pregnant women, yet I have always found the absorption so far advanced before the delivery that no obstruction was produced by it. I also know of but one case in literature, in which an ante-uterine hæmatocele constituted a dangerous obstruction to delivery at the end of pregnancy and, the diagnosis having been confirmed by aspiration, was emptied by Carl v[illegible]n Braun with a trocar. An asphyxiated but subsequently resuscitated child was born, and the mother recovered. (*Wiener Med. Wochenschrift*, 186[illegible], Nos. 28–35.)

(B) *Cystocele Vaginalis and Vesical Calculi.*—Difficulties arising during delivery from a vaginal cystocele have been observed by Brand, Robe[illegible]t, Merriman, Hamilton, Newman, McKee, Ramsbotham, Carson, Leopol[illegible]d, Balandin, Dodge, Evans, Whitham and others. Ramsbotham narrates a case in which the disease was not recognized by two physicians, and the tumor was punctured, they having mistaken it for the fœtal sac or a hydrocephalus. In every case the obstruction was quickly overcome by the introduction of a catheter, after it had caused the most severe bearing-down pains. In order to introduce the catheter properly, it should be remembered that the curve of the urethra is backward, therefore the concavity of the catheter should be directed downward. After emptying the bladder, it must be reposited between the head and the anterior wall of the pelvis, if possible above the symphysis. Vesical calculi, recognized by their hardness, mobility and extreme painfulness, may produce severe complications during pregnancy, delivery and the puerperium. The most comprehensive paper on this subject has been recently published by Hugenberger, who found in the literature, from the seventeenth century to the year 1875, twenty-three cases of vesical calculus, occurring during the priod of fecundity in women. The first four cases are by De la Motte, Deschamps, Velpeau, and Henry Thomas (*Lancet*, 1839, vol. 1, No. 21), who relieved their patients of the stones by an operation done during pregnancy. Among these cases, that of Thomas was especially interesting, in so far as the removal of the stone, 1½ inches long, 1 inch thick, and 6 drachms in weight, was done by Lisfranc's vestibular incision in the fourth month of pregnancy; the wound healed completely in thirty-two days, and the birth of a macerated child took place in the seventh month. Then comes, as a fifth case, that of Hugenberger and Heppner, who made a vesico-vaginal incision for a urinary calculus in the eighth month of pregnancy; pyæmia developed after the removal of the sutures, a premature living child was born on the twenty-third day, and death took place on the twenty-ninth day.

Seven of these twenty-three patients with calculi were delivered spontaneously; a part of them, however, suffered severe injuries.

(1) Guillemeau: Reposition of the stone, which again descended. Bruising and perforation of the wall of the bladder. (2) Smellie: The child's head forced the stone, the size of a goose's egg, before it and was then developed along with the latter; incurable incontinence. (3) Lowdell extracted a stone which had produced a vesico-vaginal fistula during the delivery. (4) Baker-Brown found a vesico-vaginal fistula which had been caused by a stone; extracted a

stone, 2 inches long, 1 inch wide and 3½ inches in circumference, through the dilated urethra, and then cured the fistula, without any persistence of the incontinence. (5) Henry Jackson removed a stone, shaped like a bullet, and 4½ inches in circumference, by a urethral incision; it had become wedged into the urethra, and had formed an obstruction in the delivery. (6) Cohn wished to do a Cæsarean section on account of "pelvic exostosis," when the woman was suddenly confined spontaneously, and the following day passed a vesical calculus, 1¾ inches long, ¾ inch broad, and ¼ inch thick. (7) Mme. L. Bourgeois extracted a stone from the bladder of a woman who had been delivered spontaneously, three months previous.

Obstetrical operations were called for eight times on account of stones in the bladder; these cases are reported by Willoughby and Arnaud (extraction with the hand), P. Dubois, Richard and Nagel (forceps), Threlfall and Erichsen (perforation).

Operations for stone were performed seven times during the delivery by La Gouche, Levret (extraction), Denmann (2) and Monod (vesico-vaginal incision). Monod twice incised the vesico-vaginal septum in parturient women, in 1849, in a 40-year-old primipara—this case is reported by Hugenberger—and in 1857, in a 24-year-old primipara, where the reposition was unsuccessful; the delivery was completed by the forceps after the extraction of the stone through the vagina, and the patient recovered spontaneously from her fistula in twenty days. This case should be placed as No. 6, in Hugenberger's statistics, and then, in conclusion, as No. 7, comes the above-cited case of Hugenberger's of colpo-cystotomy on a parturient, from whom a stone weighing 110 gm. was extracted; the patient died. A successful reposition of a stone during labor has only once been performed by P. Dubois.

A case of Sainclair is still to be added, in which miscarriage occurred in a gravida with a large vesical calculus, apparently as a result of the latter, since it had caused violent pains, fever, incontinence of urine and cystitis. Three months after the expulsion of the fœtus an oxalate of lime calculus, with an admixture of phosphates and uric acid, 5.2 cm. long, 3.1 cm. thick, and 4.1 cm. broad, was expelled spontaneously through a large vesico-vaginal fistula, which was afterward closed.

Altogether, therefore, twenty-nine cases of vesical calculus in pregnant or parturient women have been reported, and in all of them more or less severe complications have resulted during the puerperal processes.

(C) A *vaginal enterocele* may become bruised during labor and cause symptoms of incarceration (*Scanzoni*). Vaginal rectocele becomes at times an obstacle to delivery from an excessive accumulation of feces, and may even make it difficult for the head to engage after their removal (*Meissner*). Reposition, done in the lateral prone or knee-elbow position, will usually remove the obstruction quite easily. Afterward, this anomalous condition is best permanently removed by a posterior colporrhaphy, in order to prevent its aggravation and guard against future trouble in subsequent confinements.

(D) Last of all, it should be mentioned that dystocia may also be caused by extravasations of blood or *hæmatomata* in the cervical lips, the vagina and the vulva. As a rule, they result only from a rupture of the veins; either because their thinned walls could no longer withstand the increased intra-abdominal pressure during labor, or because they were bruised and torn by the passage of the child. Of fifty hæmatomata of the vulva, sixteen arose during labor; according to Percy, nine out of forty-three (*Parvin*); yet they are seldom so large as to cause any trouble; ordinarily they increase rapidly in size after delivery. Those cases are especially interesting in which the hæmatoma forms in twin births between the delivery of the first and second child. Madame Sasanoff has found five such cases in literature, besides which there exists still another case of Dewees (compare Parvin), in which the hæmatoma burst from the pressure of the second child. Four of these five cases terminated fatally; this anomaly is, therefore, a very dangerous one. As soon as its commencement is recognized, rapid completion of the delivery is indicated, either by the forceps or by version and extraction, according to the nature of the case. If the tumor be so large that it offer an insurmountable barrier to the delivery of the child, it should be incised; after which the delivery must be rapidly terminated, the bleeding checked with ice, liquor ferri and compression; the growth of the tumor is to be guarded against (see "Pathologie des Wochenbetts," Abtheilung VIII).

In an interesting case of Fehling (*Arch. f. Gynäk.*, X, 193), a gravida presented a pedunculated hæmatoma of the vagina, the size of a small apple, which almost completely disappeared in eleven days and did not return at the subsequent delivery of a full-term living child.

Hæmatomata of the cervix and vagina, which may result from their erosion and laceration, will be considered in the next chapter.

CHAPTER VII.

Disturbances of Labor due to Laceration of the Uterus.

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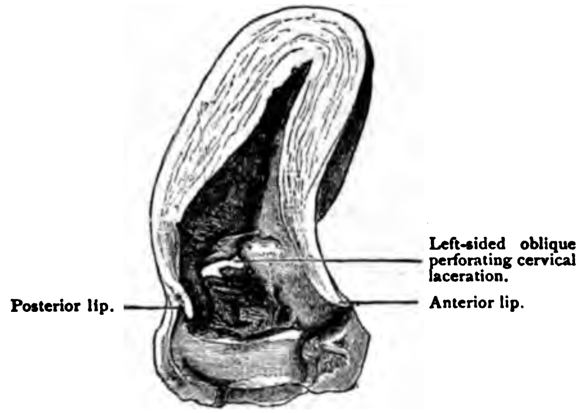
Hardly any full-term labor passes without some slight tears in the lips of e cervix; if more extensive, they may reach as far as the vault of the gina (Fig. 133), in less frequent cases they may lay open Douglas' cul-de-c. These lacerations most frequently involve both commissures. Of the cerations which are situated higher up we distinguish the incomplete hich do not involve the whole thickness of the uterine wall, and the complete or perforating. According to their direction we designate them as ngitudinal, oblique and transverse lacerations.

Etiology.—The various causes of these lacerations may be divided into spontaneous and violent; each of these groups may be further defined by the addition of the respective definite causes; thus in the term spontaneous, by solution of continuity, by erosion, and by rupture; and in the term violent, by perforation with the hand or with instruments.

Spontaneous lacerations are the most common; they are far more frequent in pluriparæ and multiparæ than in primiparæ, and occur even when there is no pelvic contraction. Their usual mode of origin is as follows: Some obstruction—whether it be hardness and rigidity of the external os, or an unusual size of the head (hydrocephalus), or a faulty attitude (face position, prolapse of an arm), or a faulty presentation of the fœtus, prevents dilatation and retraction over the presenting part of the cervix, while it is continually forced by the body of the child under the ring of contraction; hence the lower uterine segment becomes thinner and thinner, until, finally, its fibres separate, by reason of the renewed force of the pains, at the points which have been most tensely stretched and attenuated, the laceration perforating rapidly from within outward. Such lacerations will be situated, for example, in transverse presentations at the point where the head lies, viz., laterally between the external os and the "contraction ring" (example Fig. 129; No. 312 of the Munich Museum.

FIG. 129.



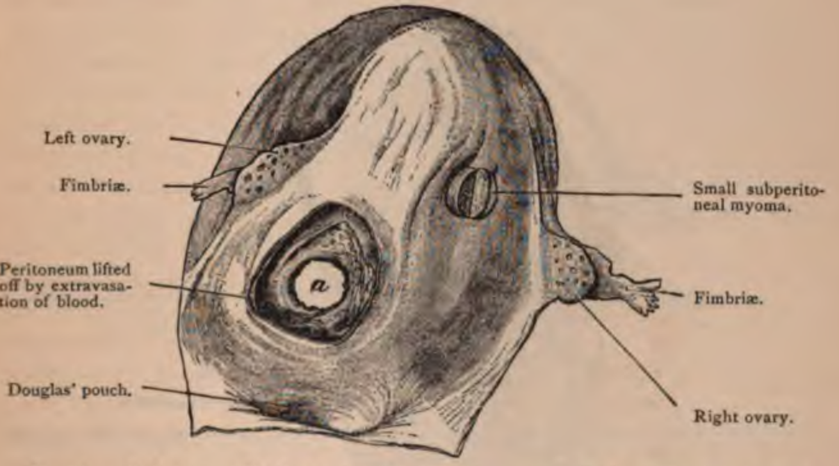
Cervix with lacerations: a left-sided oblique perforating tear through the lower uterine segment.

The spontaneous ruptures which we have designated as erosions or perforating contusions are of an entirely different nature. They owe their origin to a marked asymmetry of the parts, above all else to a contracted pelvis or to a large and hard fœtal head. We have already spoken of these at considerable length on pages 486–494. If they are not wholly circumscribed and small, but are more oblique and extensive, the laceration of the parts may follow the perforating contusion in that the fœtal part is driven into and through the bruised spot.

The rarest of the spontaneous lacerations are ruptures of the uterus which occur partly after the Cæsarean section, partly after other forms of disease of the uterine wall, chiefly with uterine myomata, and especially often in pregnancy of a uterus unicornis or of a rudimentary cornu (*Bar:* uterus bifidus; *K. Schröder* [see above *Reben*]: uterus subseptus).

Ruptures, such as those witnessed by Al. Simpson and also by Hofmeier, are very remarkable and very difficult to explain; in Simpson's case the laceration extended from the fundus uteri to the os on the left side; in Hofmeier's, the laceration was of the same length, but on the right side; both occurred in pluriparæ and the pains were not very strong; the former showed an abnormal fatty condition of the uterine muscular structure, which was absent in the latter. The most remarkable case of spontaneous rupture of an otherwise normal uterus is, however, the one which Ingerslev observed in a 32-year-old VIIpara in the eighth month of pregnancy, in whom a rupture from the fundus to within one-half inch of the internal os occurred without any external violence; the child escaped into the peritoneal cavity and the woman died from the injury in two hours (*Hospitals Tidende,* 1879, No. 5). The case of K. Schröder is also of interest, in which a rupture, 5–6 cm. long, occurred at the fundus with escape of the fœtus, following a fall in the fifth month of pregnancy (comp. *Reben*). In Slavjansky's case, too, a fall was the cause of the rupture; the child escaped from the uterus which then became inverted.

FIG. 130.


Left ovary.
Fimbriæ.
Peritoneum lifted off by extravasation of blood.
Douglas' pouch.
a
Small subperitoneal myoma.
Fimbriæ.
Right ovary.

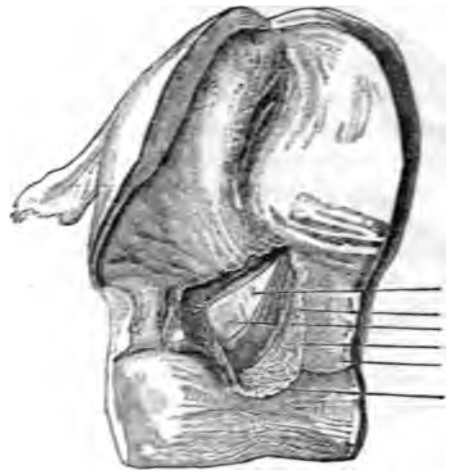
Posterior wall of a uterus which had been eroded at the promontory, with a subperitoneal myoma almost the size of a walnut.

In conclusion, mention may be made of a similar case of Plenio, of Elbing, who sutured the inverted uterus, after performing laparotomy and removing the child, which was in the peritoneal cavity, and who afterward presented the patient, whose accident was also due to a fall. In cases like those of

Ingerslev and Hofmeier, who were multiparæ (both of them VIIp.), we cannot but assume that great friability with perhaps an excessive thinning of the uterine wall must have been present, even if the microscope fails to reveal any demonstrable disease of the affected parts. For such thinning is not always plainly recognizable after the removal of the fœtus and the contraction of the uterus, which also decidedly diminishes the size of the rent—in Hofmeier's case it was only 14 cm. long, post mortem.

Ruptures of the Uterus due to Violence.—First of all, we shall speak of the manual ruptures, which arise from the introduction of the hand into an insufficiently dilated cervix. For the most part these are utero-vaginal lacerations (Example: Fig. 131). Or else there are simple cervical tears (Fig. 132), which occur during fruitless attempts to force one's way through the "contraction ring," as, for example, in neglected transverse presentations; or, finally, there are those in which the uterine body proper, when affected by some disease, has been perforated with the hand, as, for example, in attempting to loosen the placenta from the wall of the uterus.

FIG. 131.

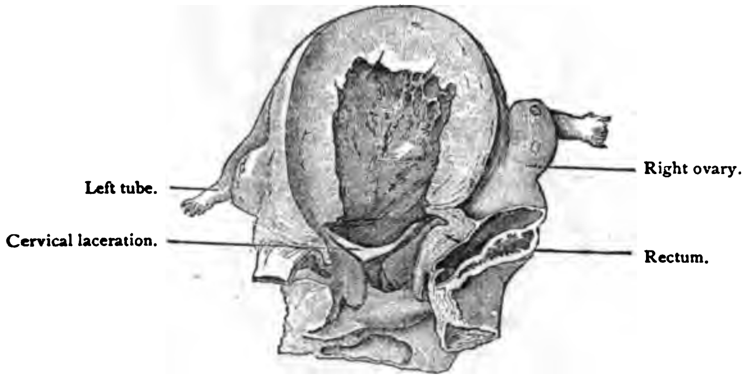


Longitudinal cervico-vaginal rupture, of triangular shape. The opening in the peritoneum is much smaller than that in the muscle. (No. 306 of the Munich collection.)

Ruptures due to Instrumental Violence.—These owe their origin in part to the forceps, in part to the blunt or sharp hook (in decapitation, embryotomy), in part to the cephalotribe. The possibility of an indirect instrumental laceration, by means of the fœtal bones in the grasp of the cranioclast and bone forceps, is not to be left out of consideration.

The Position and Character of the Laceration.—It is plain from the causes which have just been enumerated that the most frequent situation for uterine ruptures is in the lower uterine segment, between the external and internal os. All of those which involve the body of the uterus itself are, in comparison to these, rare exceptions. According to the cause, however, the shape, the situation and the condition of the edges of the tear will be different. The laceration will be high up and transverse in those cases where the stretching and attenuation of the cervix has been caused by pelvic deformity; lacerations caused by transverse presentations will be lateral and have irregular edges; they will be near or within the diseased portion of the uterine walls if such diseased state of the tissues be present (compare uterine myomata). If a portion of the uterus have been bruised against the promontory, the defect will be almost circular, as though it had been punched out, and will be situated fairly high up and almost directly underneath the " contraction ring" (see Fig. 133). Characteristic changes in the adjacent tissues will also be visible, which are well depicted in the wood-cut taken from one of our specimens (Fig. 133): Namely, the irregular retraction of the bruised and lacerated fibres, which form almost concentric circles around the opening, though they vary according as they are submucous or subperitoneal; then the hemorrhagic suggillation of the tissues and the detachment of the peritoneum caused by the effusion of blood. The external and internal openings are in this case almost exactly alike in size.

FIG. 132.



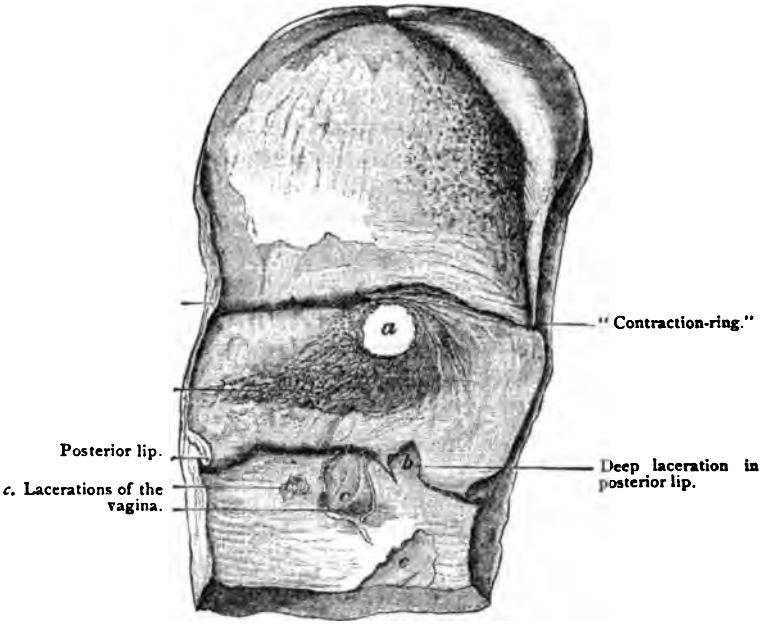
Semilunar transverse laceration of the anterior cervical wall immediately below the " contraction ring;" placental site on the anterior wall to the right; the posterior wall is cut away; fissured external os.

If the lacerations have been produced spontaneously by a distention of the cervix or violently by the hand, the edges are not sharply cut but more jagged, the internal opening is wide, while that into the peritoneum is much smaller (Fig. 131), the point of this cone may even communicate with the peritoneal cavity by only a very small opening, through which a large subperitoneal effusion has changed into a peritoneal one. Only in rare cases does the peritoneum become detached over an extensive area and the cavity still remain closed; in other words, the rupture is an incomplete one.

A combination of lacerations, several of them spontaneous and one due to violence, may be met with, varying according to the cause and the operations which are rendered necessary on account of the occurrence of a rupture. Fig. 133 shows above at *a* the spontaneous perforating bruise of the parts, at *b* a deep tear in the cervix, which might have been the result of the use of the forceps, in case they were applied before the cervix was fully dilated, and three lacerations of the vagina which certainly did not arise spontaneously (*c*, *c*, *c*.).

The appearance of the uterine wall varies considerably with lacerations of

FIG. 133.


a
b
c
"Contraction-ring."
Posterior lip.
c. Lacerations of the vagina.
Deep laceration in posterior lip.

Inner surface of the uterus eroded by the promontory (*a*). Deep laceration into the external os (*b*), a three lacerations of the vagina of different size. (No. 313 E, of the Munich collection.)

the cervix. In all probability we might state that the ruptures which are present in Figs. 129 and 131, as well as the round perforation in Fig. 133 arose spontaneously, because the lower uterine segment is very much thinner in all three cases; in two of them, however, the muscular structure of the body of the uterus is considerably thickened, while in Fig. 131 the thin uterus has apparently suffered no material distention of the cervix.

A complete detachment of the lower portion of the uterus in the form of a ring, the centre of which is the os uteri, is very rarely met with, as is also the separation of a portion of the cervix with the external os when due, for example, to the use of instruments for extraction; about twelve such cases have been observed. According to the index in our catalogue, the circular segment, which is represented in Fig. 128, is said to have been torn off with the cephalotribe; the ring on one side, probably the posterior, is very narrow, and on the opposite side, probably the anterior, is several centimetres broad.

In conclusion, it may be said concerning the causes of rupture of the uterus, that they occur much more frequently among poor people than among those in better circumstances (*Bandl*); that they are met with oftener in the case of boys than of girls; that especially stenoses, cicatrices and chronic inflammatory processes, such as parametritis or syphilitic placental endometritis, are mentioned as predisposing causes, and that the spontaneous ruptures have been attributed to large doses of ergotin (*Meigs*, *Bedford* and *Parvin*).

On the part of the child, besides the causes already given, should still be mentioned the coalescence of twins and, according to Parvin, the ragged edges of a lumbo-sacral spina bifida.

Pelves which are contracted by exostoses and hard tumors may, during the delivery, produce an erosion of the peritoneum from without by friction and a subsequent laceration of the uterine wall (compare Stadfeldt, Chap. "Pelvic Contraction").

We have still to consider the force necessary to produce the rupture. In those due to violence it is naturally the operator, in those occurring spontaneously either the pains or the efforts at straining. The latter is evidently sufficient in all cases of disease of the uterine walls; in this way the rupture occurred in a case observed by me after a Cæsarean section, from lifting a heavy keg in the subsequent pregnancy. In other cases—for example, in a rudimentary uterus—it is the force of the growing ovum which ruptures the thin walls of the uterus; these are, however, exceptional cases. The ordinary spontaneous lacerations are produced by the pains and the firm wedging in of the lower part of the uterus, inasmuch as the contraction ring glides always higher and higher, the body of the uterus becomes progressively thicker, the wall of the cervix continually thinner and the difference between the resistance and the forces ever greater; at the same time the assistance derived from the abdominal muscles is prematurely called into play by the increased resistance, or in other words by the uterine contractions acting in an abdominal direction and assisted energetically by the abdominal walls.

Occurrence and Frequency.—In a faultily formed uterus, naturally, the ruptures occur for the most part during pregnancy between the second and fifth months; after the Cæsarean section, however, during the second half of pregnancy. Those met with during the delivery occur most frequently toward the end of the stage of dilatation, then at the commencement of the expulsive stage, and least often in the third stage.

The difference in the frequency of their occurrence in the country and in institutions will and always must be very great; the same is true in regard to the various clinics; its occurrence will be so much the more frequent, the greater the number of contracted pelves of moderate degree, the greater the desire of the accoucheur to proceed to operative interference and the less experience he has had with it, the more frequently the assistants are changed, the more violently the physician forces his way in with his fist and the less he seeks to overcome any resisting obstruction slowly, carefully and gently. I have had assistants who otherwise were very capable and yet, on account of this habit, have actually caused me anxiety during my absence from the clinic. I give a few statistics below as an illustration of what I have said:

Collins	found	1	rupture	of the	uterus	in	482 labors.
McClintock	"	1	"	"	"	"	737 "
Bandl	"	1	"	"	"	"	1200 "
Jolly	"	1	"	"	"	"	3403 "
Ramsbotham	"	1	"	"	"	"	4429 "

These figures, taken from Parvin, are amply sufficient; much more interesting, however, would be their division into ruptures due to violence and those occurring spontaneously; in other words, into those which are and those which are not due to culpability on the part of the operator. Six ruptures of the uterus have been noted among the 4000 cases of confinement which have occurred in the last five years in the clinic at Munich; two were cases of violence and four spontaneous.

Symptoms.—If a cicatrix of the uterine wall or the wall of a rudimentary horn, which is generally very thin, gives way during pregnancy, such an injury is preceded by few if any symptoms, at the most by a circumscribed pain at some point of the uterus. At the time of the laceration the further group of symptoms depends partly on the hemorrhage connected with it, partly on the escape of the fœtus and partly on the contraction after the latter has taken place. The same symptoms are to be observed with the rupture of a tubal or ovarian pregnancy; it is not necessary to repeat them since they have already been described. If the wall of the uterus is anæmic, if the escape of the ovum is rapid and complete, it often escapes with membranes intact, and the contractions of the uterus are so good after it is emptied that no more hemorrhage takes place into the abdomen or outward. In this way the patient may, after she has successfully recovered from the first shock, bear her condition for some time with a moderate amount of pain. Of course, the fœtus quickly dies, and, since it is encapsulated, a protective covering may be formed about it, and a lithopædion thereby arise. A case of Baer (*New York Med. Journal*, 1885, February 24th, page 224), most clearly illustrates this condition; in it a "sack" had formed around the fœtus, which had escaped into the abdominal cavity sixteen days before, and the patient died twenty-five days after the rupture. As a rule, however, germs of decomposition find an entrance through the uterine wound, and the patient, if she does not succumb from hemorrhage, dies speedily, of sepsis.

In many cases of contracted pelvis, hydrocephalus, rigidity of the os uteri, swelling of the cervical walls, the development of an erosion of the uterine wall during labor is preceded by an extreme degree of painfulness of the vaginal fornix and an escape of blood (hæmatoma) into the mucous, muscular and subserous tissues, sometimes associated with an increasing œdema extending along the vagina down to the vulva. The os uteri becomes narrower instead of wider, the head of the child appears to stand higher, blood escapes in a variable quantity until, all at once, with one strong uterine contraction accompanied by the severest pain, the train of symptoms to be subsequently described shows itself.

While the uninjured peritoneum is sometimes found detached from the muscular structure by bubbles of air in cases where the uterine wall has been eroded, now and then in cases where there is a small communication, crepitation is to be felt in the uterine wall; starting from the pelvic cellular tissue an emphysema of the mons veneris, the thighs, the skin of the abdomen, extending even up to the thorax, is developed, which, as the author has once observed, may be associated with livid, cadaveric-looking discolorations of the abdominal integument and the thighs (minutely described case No. 871, 1875, "Ber. und Stud.," II, p. 81). This has been observed by Kiwisch, McClintock, Montgomery, Paully, Ross, Crighton, Schatz and the author (twice, the first time in October, 1866). Fatal air embolism may quickly arise from this emphysema of the uterus.

In almost one-half of the cases the most prominent symptom of the laceration of the uterus is the sudden change in the uterine contractions, which cease altogether in more than one-third of the cases, or somewhat more slowly give place to a uniform uninterrupted pain in the whole of the abdomen; the difference is most striking when the pains were previously very strong. According as the presenting fœtal part is fixed in the pelvic inlet or not, and according as larger or smaller parts of the child's body have escaped, there will either be no recession of the part at all, or but a slight one, or else the fœtus escapes entirely through the tear and disappears completely. At the same time, a profuse discharge of blood externally is present in about one-quarter of the cases, the form of the abdomen is suddenly changed; the fundus uteri disappears, especially when the child has escaped, the abdomen becomes broader and the fœtal parts are more plainly felt through the abdominal walls, while the body of the uterus is no longer palpable, or can be discovered pressed to one side, reduced to the size of a puerperal uterus. The previously audible heart sounds cease, the movements of the fœtus can no longer be felt, and the woman presents the appearance of collapse, leading one to apprehend the worst. The countenance appears sunken, the eye dim, dyspnœa and anxiety are great, the pulse is very small, the temperature internally is very high, while the surface of the body, especially of the extremities, is cooler; the patient breaks out in a cold sweat, attacks of syncope occur and death supervenes with or without convulsions.

Exceptions to these, the usual symptoms, occur with reference to the pains, when these do not cease, but still continue in the usual manner, even when the lacerations are extensive; of course, this is very rare and occurs only when the greater portion of the child still remains in utero. Still rarer are the cases in which the collapse subsides gradually after the completion of the delivery, sepsis follows, and the woman succumbs. A very instructive case of this kind has been reported by me, in which, without any laceration of the peritoneum, the sloughing extended slowly under the peritoneum up to the thorax ("Berichte und Studien," Bd. III, pp. 175–76).

If strict antiseptic measures have been used, large perforating ruptures of the uterus may heal without sepsis, as shown by the cases of Fleischmann and others. Such patients, however, are exposed for many weeks to extremely dangerous hemorrhages, arising from the eroded arteries of the wall of the uterus. I described a remarkable case of this kind, in which death took place on the thirteenth day from secondary hemorrhage, arising from an artery in a bridge of tissue extending along the wall of the uterus over a defect, about the size of a dollar, which had already cicatrized ("Berichte und Studien," Bd. I, p. 138). This patient had a temperature of only 98.9° F., and a pulse of 112 on the day following the violent rupture and up to the time of her death but a slight febrile disturbance existed (up to 103.1° F.); in fact, she was almost free from fever before the beginning of the hemorrhage.

Still more remarkable are the cases with a moderate degree of a flat contraction of the pelvis and with a hard and thick fœtal skull, on which two pressure spots are visible, and death takes place only after several weeks, inasmuch as sloughing of the pelvic connective tissue extends from the contused points of the cervix, causes thrombosis of one femoral vein, with sloughing of the thrombus and metastatic processes in the lungs, and finally death. This event is so rare that I append a few sentences from the post-mortem conditions found in the case reported at length in my "Berichte und Studien," Bd. III, p. 173):—

> In connection with the ichorous crumbling thrombus of the left femoral vein, a sanious œdema of the subperitoneal connective tissue extended upward through the femoral ring, chiefly along the fascia of the interal iliac muscle, and this again connected with a fistulous tract in the pelvic connective tissue on the left side, which started from a gangrenous spot in the cervix uteri. Aside from fibrinous adhesions of the intestines and a fresh agglutination of the intestines to the fundus uteri, there was found on the inner surface of the bladder, 1 cm. above the opening of the left ureter, a discolored ulcer 3 cm. long, covered with a scab which was incrusted with phosphates, and corresponding exactly to this on the anterior wall of the cervix uteri, 2 cm. above the external os, a circular opening was found in the pos-

terior wall of the uterus, and the sound passed from here into a sinuous ichorous mass of tissue between the uterus and the rectum. The vessels of the uterus were free from abnormal contents. The asphyxiated child, 52 cm. long, 3420 gm. in weight, had two pressure spots on the skull, corresponding to the first vertex position; the circumference of the head measured 35 cm., and there was a hæmatoma over the frontal and parietal bones. The first stage had lasted 37¾ hours; the second, 1⅙ hours, and the whole delivery had proceeded spontaneously, like the easy first labor, excepting two attacks of vomiting and moderate swelling of the anterior lip of the cervix. The child remained healthy. The mother died on the twentieth day.

Corresponding necroses are found in the mucous membrane of the rectum, similar to those in the bladder, and, in the case under consideration, I cannot but believe that the rectum might not have been without significance for the infection of the portions of the uterine wall which were eroded.

Still more striking are the cases in which puerperæ succumb immediately or some days after the delivery, without having manifested any symptoms whatever of a laceration of the uterus. Cases of this kind have been published by most competent authorities, thus by Hervieux-Dubois after internal version, by Tarnier after external version, from a footling to the vertex-presentation, and by Parvin after internal version (six days post partum, from septicæmia).

In a case in which I had diagnosed a large left-sided sub-peritoneal hæmatoma, and where the patient's condition was very good after using the ice-bladder for about five days, sudden collapse with violent pain set in and death supervened. The peritoneum was perforated, and the post-mortem examination revealed a rupture about the size of a fist, which a physician had made in attempting to extract the head. Strange to say, there was only moderate pain, and the only symptom was the loss of blood, in spite of the extensive injury.

I am therefore of the opinion that the shock alone does not suffice to explain this great difference; that whenever an intense poisoning, and especially a direct introduction of numerous poisonous germs occurs, the shock will always be very great and the fatal issue very rapid; that, on the contrary, when the injury alone occurs without the introduction of bacteria, the immediate effect depends solely on the amount of blood lost and the rapidity of the occurrence, but not on the length and breadth of the tear. Withal the external hemorrhage need not necessarily be marked, but may, as I have repeatedly observed, extend subperitoneally so high that the peritoneum around the cervix is lifted off, forming a mass the size of the fist, and both kidneys are imbedded in a mass of blood; finally the peritoneum yields and, with its rupture, the hemorrhage quickly becomes fatal.

Diagnosis.—The intense local pain, the sensation of the patient that something has given way internally, the great anxiety and oppression, and the sudden change in the pains awaken even in the most inexperienced the suspicion that a rupture of the uterus has occurred, which becomes a certainty by the recession of the presenting fœtal part. Furthermore, if round necrotic portions are found on the child's skull, one will be forced to suspect a similar condition of affairs in the cervix, even if no very threatening symptoms are manifested by the puerpera.

The bladder-like bulging out of the wall of the uterus above the pelvic inlet, the high position of the "contraction ring," which is displaced upward nearly to the navel, and a circular or only a circumscribed painful swelling of the lower portion of the cervix are signs of the gravest import, that a rupture is threatening.

Sudden collapse, sudden change in the shape of the abdomen, the rapid occurrence of a subperitoneal effusion of blood, recognizable by its soft, compressible quality, or of an emphysema, which is unmistakable from the crackling elicited on pressure, are proofs of the occurrence of the laceration, as is also the possibility of feeling the fœtal parts much more clearly through the uterine wall. Nevertheless, a large number of lesions of the uterus, especially perforating contusions and non-perforating lacerations, will heal up without having been recognized. This is more apt to be the case with tears which are continuous with lacerations of the external os, whose separation from the other ruptures Reimann has correctly demanded.

The *prognosis* was formerly very unfavorable. In 580 cases which Jolly tabulated, but 100 mothers, and only 8.4 per cent. of the children survived (*Ramsbotham*). We must not, however, state the prognosis so simply, by grouping together all cases, both those occurring spontaneously and those due to violence. As my cases, cited above, teach me, I consider the spontaneous variety more favorable than the violent, and both, since the introduction of antisepsis, are better than they formerly were; that is to say, I believe that, with the decline in the frequency and intensity of infection, the fatal cases from so-called shock will decrease, and the possibility of the recovery of the patient increase.

The main causes of death are: hemorrhage, septicæmia or acute peritonitis, also air embolism (two cases are reported by me in "Ber. und Studien," 1876, Bd. II, pp. 79–85); furthermore, incarceration of the intestine in the rupture has been recorded as a cause of death. Fleischmann has called attention to the fact that ruptures through the anterior wall of the cervix all ended fatally, while of fourteen cases of laceration of the posterior wall, five recovered. My father's experience, as well as that of Hofmeier, Albert and Wenzel, proves that, when a rupture of the uterus has once healed, the woman is easily exposed to a repetition of the injury in the next pregnancy. The patients of my father and Wenzel recovered both times. Several observations have also been recorded where patients, having recovered from rupture, have, after one and a half to two years, spontaneously given birth to other children without recurrence of the rupture: cases of Leopold, Franz (Dresden), Rakin (Chicago).

Treatment.—The prophylaxis has already been partly described in the treatment of the first stage of labor in contracted pelves, and partly in connection with rudimentary uterus and myomata of the uterus, also in the treatment of rigidity and stenoses of the soft parts.

In case rupture of the uterus is threatening, the first indication is to terminate the delivery rapidly, eventually incising the cervix if it is not sufficiently dilated, or quickly dilating it, for example, by means of the tensely filled colpeurynter in placenta prævia and transverse presentations—a practice lately again recommended. In case the lower uterine segment is very much expanded, especially if bulged out toward one side, we may seek to counteract the rupture which is then imminent, by external counter-pressure, although this is not always successful (*Hofmeier*). If, on account of an extreme degree of pelvic contraction, the child cannot be extracted intact, and if it is dead, we must perforate at once and extract with the cranioclast, should the head be presenting; in case a transverse presentation exists, decapitation or embryotomy is indicated. If the expansion of the lower uterine segment is very great, the attempt to turn is only permissible when the child is living, and must be performed under complete anæsthesia and with great caution. If the pelvis is roomy enough to allow the head to pass, the forceps would be indicated; however, of 101 forceps cases, only 14 women were saved, while of 214 versions, 47 or 23 per cent. recovered, and of 38 laparatomies, done at the proper time, 26 or 68.4 per cent. of the mothers made a good recovery.

If the rupture has already taken place (if the child has not escaped into the abdomen, and the pelvis and soft parts permit of the extraction per vias naturales), the most rapid completion of the labor is called for, by the forceps, perforation, cranioclast, version or decapitation, according to the nature of the case.

If the child has partially escaped from the uterus, without having changed its longitudinal position, it should be extracted in the usual way; if it has almost entirely or completely escaped, we must not follow through the tear, but perform laparotomy, extract the fœtus, cleanse the abdominal cavity and sew up the rent according to Sänger's method.

If the delivery is successful through the natural passages, and the tear is a perforating one, it should be drained with a large glass tube, the abdomen washed out with a 1 per cent. solution of thymol or boric acid and the ice bladder applied to the abdomen. The drainage tube is to be retained by iodoform gauze packed into the vagina. If the delivery has occurred by the natural passages, and much liquor amnii and blood or the placenta has escaped into the peritoneal cavity, laparotomy would be indicated, with subsequent suturing of the uterus. It is possible that the placenta may not yet be found, if it has been shoved up under the peritoneum by the operator who produced the tear, as I myself have once observed at the post-mortem examination of such a case which had been brought into the clinic.

The management of crusts and of perforating contusions of the uterine wall in cases of contracted pelvis, will be discussed under the head of Pathology and Treatment of the Puerperium.

CHAPTER VIII.

Disturbances of Labor due to Delayed Expulsion of the Afterbirth. Abnormal Adhesion of the Placenta to the Wall of the Uterus and Hemorrhage during the Third Stage.

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1. *Definition.*—If more than two hours have elapsed after the birth of the child, and the placenta has not yet come away, in spite of repeated efforts at straining, we call the expulsion of the placenta delayed.

If there is a delay in the expulsion of the placenta, without the existence of a stricture of the "contraction ring," or without any firm constriction of the already loosened placenta, and if the latter is not delivered by the energetic use of the ordinary external and internal manipulation, we are forced to assume that it is abnormally firmly attached to the uterus.

If, finally, a large quantity of fluid blood and clots is suddenly expelled at intervals during the third stage, or if a continuous dropping or trickling of blood (stillicidium sanguinis) occurs, if the quantity of blood lost weighs more than 500 to 1000 gm., we designate it as a light hemorrhage; a loss of blood from 1000 to 1500 gm. is designated a profuse hemorrhage, and a loss of from 1500 to 3000 gm. a dangerous hemorrhage.

Etiology.—Delay in the expulsion of the placenta may have its origin in an anomaly of the expulsive forces, in an obstruction to its escape from other diseases and in too firm an attachment of the placenta. Weak and spasmodic pains, the causes of which we have already sufficiently discussed on page 504 *et seq.*, very often continue from the first and second stages into the third. In the latter, however, they arise when the labor has proceeded too rapidly and precipitately (partus præcipitatus, see page 515 *et seq.*), or when the organ is exhausted from very protracted and great exertion, or when, during the delivery, compression and laceration of the tissues have occurred, which make the subsequent contractions very painful. Premature, unsuitable and unskillful attempts to remove the placenta, rough pressure on the fundus, traction on the cord, repeated palpation and irritation of the wounded parts about the introitus and the cervix lead to a spastic stricture of the uterus. That the use of the abdominal muscles by straining can alone expel the placenta is a fable. Whoever carefully observes the process will find that an after-pain first occurs, and, when this has attained a certain height, the half-confined woman commences to bear down; if no contractions are present, or a stricture holds the placenta back, the parturient may bear down as hard as she pleases, but the placenta does not escape. Since, however, almost without exception in delayed expulsion of the placenta a portion of the latter has become already detached and, being bent over, presses the walls of the uterus apart, and since the places from which the afterbirth has been loosened are prevented from contracting by reason of the adhesions of other portions, there is a greater loss of blood than in normal cases. The blood flows either directly outward or, if the os is obstructed, collects in the uterus (internal metrorrhagia), some of the blood escaping from time to time with each recurring pain. The uterus in such cases reaches above the navel and not infrequently is situated somewhat to the side; it is, by reason of the faulty contraction, soft and difficult to map out underneath the abdominal wall; it is broader than usual and if it is grasped below the contraction ring and raised up, we see how the cord hanging out between the external genitals is drawn up—a proof that the placenta is still above the lower uterine segment. If the uterus is spastically contracted, it feels hard and is situated high up; its manipulation is very painful for the patient, the sensitiveness is greatly increased with the occurrence of each new pain and causes the patient to cry out aloud with each attempt, however light, to express the placenta. The shape of the uterus in such cases is often like an hour-glass, and a portion of the placenta projects loosely into the lower uterine segment.

While the general condition of the parturient, when the contractions of the uterus are too weak, is good and her pulse is only increased in rapidity whenever the loss of blood exceeds the usual amount, in spastic contraction the temperature is often somewhat elevated, the patient is restless and anxious, and is vexed with the physician who approaches to remove the placenta. An abnormally increased painfulness of the uterine wall, together with short frequent contractions, is characteristic of hemorrhage into the cavity of the uterus—an hyperæsthesia which disappears as soon as all clots have been expelled from the uterus by energetic compression. In not a few cases the expulsion of the placenta is delayed simply because the uterus is crowded away from the pelvic inlet, whether it be by the over-distended bladder or by a full rectum or by tumors in the wall of the uterus itself. The same effect may be produced by the rapid formation in the third stage of a hæmatoma in the lower portion of the genital canal.

Incorrect grasping and pressing of the uterus may in like manner delay the expulsion of the placenta, when, owing to thick abdominal walls, the fundus is not held on all sides, but is forced against the vertebral column or to one side. A delay in the expulsion may, finally, be due to a faulty position of the parturient which prevents her using the pains to the best advantage.

The cases are rare in which the placenta has become loosened and has escaped from the uterus, but cannot pass outward, because it has escaped through a laceration in the vaginal or uterine wall into the cavity of the peritoneum.

Diagnosis.—The inexperienced accoucheur will often diagnosticate an abnormal adhesion of the placenta, when its expulsion is simply delayed. Often have I, when called by assistants and internes, on account of supposed adhesion of the placenta, readily expressed it. Of course, all obstructions must first be set aside; if the bladder be full, it must be emptied, the uterus grasped about the fundus on all sides, and palpated to ascertain whether it be soft and bulged out in places, which should be brought into a state of energetic contraction by moderate kneading. At the same time 0.05 to 0.1 gm. of ergotinum bis depuratum (Wernichii) should be administered hypodermatically; the amount of blood which has escaped should be weighed if possible, and, after placing fresh sheets under the patient, every drop of blood which escapes collected. With the occurrence of a fresh pain compression should be repeated and the patient directed to bear down, while attention is paid to the facts whether blood clots are passed, or the umbilical cord descends lower, or whether the perineum bulges at all and the vulva opens. If the obstetrician pursues this practice systematically, inspires the parturient with patience, and does not too quickly lose his own, he will succeed in expressing many a placenta which at the time he is almost fully convinced is abnormally attached.

If, on the other hand, a spastic stricture is present, the uterus is very painful and the loss of blood only moderate, then an injection of morphine (0.01) should be given in the abdomen, or an enema of 1 gm. of chloral hydrate in 25 gm. of water, or a sinapism applied to the back or above the symphysis. If these measures, which are very often effective, fail, or if the loss of blood becomes greater, then anæsthesia should be induced, so as to undertake the expression of the placenta as soon as insensibility is obtained.

If the abdominal walls are too thick, or if an exudation or tumor is present in the abdomen, which makes it impossible to grasp the fundus uteri, then the placenta should be extracted from the vagina in the old way, by grasping and making light traction on the cord while pressing upon the afterbirth in the direction of the hollow of the sacrum. After its removal the escape of blood must, of course, be watched, and ergotin (0.05–0.1) administered hypodermatically.

2. If all attempts at expression fail, if the loss of blood is excessive, and if the parturient has previously been subject to abnormal adhesion of the placenta, we shall be obliged to assume that the attachment of the afterbirth is too firm.

The causes of this abnormity are still obscure. Often there is nothing to be found on the placenta which would warrant us in assigning it as the cause of the adhesion. Not infrequently it is small, very thin placentæ which must be artificially detached.

It has already been stated, on page 57, that an unusual large deposit of lime in the decidua and the villi, does not bear any causal relation to this disease. Frequently fibrous membranes, old effusions of blood and placenta marginata are to be found in cases of abnormal adhesion. There is also no doubt that a long-standing endometritis may produce this result; whether syphilis of the decidua or of the placenta (gummata) plays any part in it is still doubtful.

It has already been stated, that the placenta must be quite frequently detached in cases of myomata of the uterus; in these it is the profuse hemorrhage, but not always an abnormally firm attachment, which calls for the artificial removal of the placenta.

The same remark holds true of placenta prævia, and also of twin placenta.

Lastly, it is a fact which Fehrsen (see above) and I have repeatedly witnessed, that women are subject to placenta accreta in several successive labors, and this circumstance chiefly favors the view that an abnormal condition of the endometrium is of importance for the occurrence of adherent placenta.

At first Engel, then Rokitansky, Betschler, Kiwisch, Valenta, Schröder, and many others have called attention to the polypoid prominences at the site of the placenta after its normal and artificial separation ; Jastrebow looks upon this as a partial atony, Maslovsky as a chronic interstitial metritis. It is still questionable whether very large placentæ predispose to abnormal adhesion ; it is much more probable that, under an erroneous diagnosis of adherent placenta, they are artificially removed, since considerable hemorrhage occurs more easily in such cases. It is certain, however, that, since the introduction of Credé's method, abnormal adhesion of the placenta has become much less frequent than before, and that, under the more expectant treatment of the third stage, as described by me (page 193), this trouble occurs still less often than with Credé's method.

The *diagnosis*, usually made only by way of exclusion, becomes positive, when, after the introduction of the hand into the uterus, the attached portions must be loosened with a certain amount of force. It is, however, no longer possible to arrive at this conclusion with a placenta already removed, since all of the conditions which are enumerated as proofs of a preëxistent pathological adhesion, may also be found in many placentæ which have come away easily. Most of these conditions are certainly only in part of any pathological significance, such as fatty degeneration or condensation of the decidual tissue. Small-celled infiltrations and fibrous formations occur frequently in syphilis, but the proof that they are of a syphilitic character is hard to establish. This is true also of sub-decidual thromboses, which, without doubt, are also met with in non-syphilitic persons. Wedge-shaped infarctions of the placenta, which are situated with their base outward and their point toward the fœtal surface, are yellowish or reddish, present rather solid tissue, and arise from thrombosis ; the villi are mostly clouded, their nuclei can no longer be stained ; the vessels are impervious, the epithelium of the villi is lost and the villous tissue itself is destroyed.

The sub-chorionic, for the most part well-marked, yellow, bulbous elevations, are composed of thick hyaline or filamentous fibrin, which incloses red and white blood-corpuscles ; in places they appear softened. Here the fibrin forms granular masses which are sometimes mixed with amorphous or crystallized products of the disintegration of the red blood-corpuscles or with freshly-escaped blood (*Ziegler*).

J. Greene believes he has found that an amyloid degeneration, a peculiar chemical change of the gelatinous fundamental tissue of the villi and the decidua, exists, which at times may be associated with an analogous change in the amnion and umbilical cord, and exactly resembles this disease in other organs, giving rise to the opposite condition—abortion and premature labor.

Virchow, Slavjansky and E. Fränkel consider syphilitic diseases of the placenta as proven. The former found nodes projecting from the hypertrophied decidua into the tissue of the placental cotyledons, with a firm, fibrous periphery and a yellowish softer centre, which, on microscopic examination, were found to contain large-celled connective tissue and an aggregation of partly fatty smaller cells; in other words, they showed the appearance of a kind of gummatous disease. According to E. Fränkel, the characteristic changes of a syphilitic placenta are said to be an increase in the volume, consistency and weight, also a pale yellowish color, a plump form of the villi, a filling up of the villous spaces with medium-sized cells derived from the vessels, with a proliferation of the villous epithelium and subsequent obliteration of the vessels and shrinking of the cells—the destructive, granulating proliferation of the placental villi. The confirmation of these affections, so often present in syphilis, as exclusively syphilitic, is still to be furnished; for the descriptions of syphilitic placentæ as given by Ziller are decidedly different. The latter author considers the gummatous nodes, varying in size from a pin-head to a walnut, as the most characteristic. On cross section they present concentric lamellæ, consisting externally of fibrous tissue of a grayish-yellow color, centrally of a soft or more fluid, cheesy and reddish-yellow mass. The decidua is said to be greatly thickened, clouded and covered with yellowish-white spots; besides it is impossible to detach it in large shreds from the diseased portions. Ziller found the villi in these nodes inclosed in a granular, calcareous, branching network of fibrin, with scanty or absent nuclei, and without vessels or epithelium; the intervillous spaces contained abundant small round cells. When placental and fœtal syphilis co-exist, the chorion contains much fibrin and aggregations of small cells; its vessels are thickened and infiltrated with small cells, and often only partially encircled by the infiltration; these conditions may extend to the vessels of the umbilical cord. Ziller terms this endometritis decidualis et placentaris gummosa.

The subject of the artificial detachment of the placenta, its results and its dangers, will be considered under the head of Obstetrical Operations.

3. *Hemorrhages in the Third Stage.*—The hemorrhages occurring during the first and second stages have already been discussed in connection with their causes (placenta prævia, rupture of the uterus, premature detachment of the normally situated placenta, carcinoma and myoma of the uterus, lacerations of the cord, bursting of varices, thrombi of the vagina, etc.). In the preceding sections, 1 and 2, some of the causes of hemorrhage in the third stage have been considered. Others, however, which are quite important, still require discussion. To the first of these belong the lacerations of the mucous membrane of the introitus vaginæ, especially those at the base of the clitoris, in which arteries or large veins are opened; then come lacerations of the perineum and the vagina, bursting of a varix in the vagina, or of one of the lips of the cervix, deep lacerations and perforations of the cervical canal, besides commencing displacements of the uterus, especially inversion, and finally, also, atony of the placental site. All of these anomalies will be discussed in detail under the head of puerperal hemorrhages,

especially because, as a rule, they can be differentiated and controlled with certainty only after the removal of the placenta. In this connection it suffices to state that many a puerpera will be saved much blood, if one makes it his duty, in the case of every artificially-confined or half-confined woman suffering from hemorrhage, to separate the labia minora and to cleanse the base of the clitoris with salicylated cotton, in order to see whether there is not some bleeding spot here, and to compress it at once with a firmly applied pad of cotton; or, in case the hemorrhage is arterial, to pass a catgut ligature around the vessel and arrest the hemorrhage. Then it will be unnecessary to hurry the removal of the placenta.

Furthermore, we must bear in mind to remove, in the first place, all factors which, on the one hand, hinder the contraction of the uterus, or, on the other hand, may interfere with the application of some methods of arresting the hemorrhage, *e. g.*, an unfavorable position of the half-confined woman, an improper location of the bed, defective illumination of the room; above all things, however, the relief of any over-distention of the bladder and rectum, which is but too often forgotten. Sometimes it is advisable to place the parturient on her side in order that, while we grasp the fundus uteri with one hand, we may get a better view and judge of the quantity of blood escaping from the external genitals. This will also enable us to decide more certainly whether the blood is arterial or venous.

An internal examination should be avoided as much as possible, and should be made only when an excessive venous hemorrhage occurs while the uterus is well contracted and no laceration of the external genitals is present; that is to say, in cases where we apprehend a lesion of a vein, it would become necessary to make an exploration of the vagina before removing the placenta, in order to discover any existing lacerations of the vagina, a hæmatoma, or a deep laceration of the cervix. If these be present, it would certainly be good practice first to express the placenta, or, in the case of large vaginal tears, to extract it manually from the vagina, in order to lay bare the injured part with bullet-forceps and specula, and to unite it directly.

Careful attention to the general condition of the parturient must never be omitted during the third stage; the pulse, temperature, respiration, color of the lips, cheeks and the conjunctivæ, should be noted, especially in those who are already anæmic and delicate. Fainting spells must be treated with analeptics: ether, wine, cognac with egg and with strong coffee; in such cases, the hand should never leave the fundus uteri, although the speedy removal of the placenta is not always necessary in case the bleeding is not too severe.

If, in spite of all these precautions, the hemorrhage is not controlled, if the puerpera has lost about 400 to 500 gm. of blood, then, even if less than two hours have elapsed since the delivery, the placenta is to be removed by Credé's method; after this has been done, we must search most carefully for the causes of any continuation of the hemorrhage, in order to check it by the proper means. Sometimes it will be necessary to anæsthetize the patient, if her sensibility is very great, the expression is difficult and there is danger in delay. That the most careful examination of the expressed placenta and membranes should be made, is a matter of course.

There are still other cases, in which, although the delivery was at full term, neither the expression nor the detachment of the placenta is successful, on account of too firm a contraction; at most, pieces of the afterbirth are torn away with the cord. Such cases must be treated in the same way as retention of the placenta after abortion and immature labor. After some time large pieces, as a rule, come away, unless fibrinous or placental polypi or deciduomata are formed. The possibility of absorption of large pieces of the placenta has been admitted by some, and examples have been reported, two by Nægele and one each by Villeneuve, Procher and Thrush, but I have never observed anything of the kind and do not believe in it. If the discharges are carefully examined, the placenta will always be discovered in the blood-clots, either in pieces or entire. Indeed, it may not be expelled until after six weeks, or it may come away spontaneously at the end of six months (Case of Vaudam: *Presse méd. belge*, 1878, No. 51), or it may be removed artificially, as is proved by a case of Jones, after an immature labor in the sixth month (*Brit. Med. Jour.*, May 18th, 1878). We have also seen cases of patients sent to us as suffering from retention of the placenta, in whom the uterus after an abortion was firmly closed and small. An observation for a period of nine days showed no discharge of blood, the uterus became smaller and the patient was discharged; after some days, however, she returned, with severe hemorrhage, and then the placenta came away.

SECTION III.

Disturbances of Labor due to a Faulty Condition of Non-Sexual Organs.

CHAPTER I.

Dystocia due to a Faulty State of the Abdominal Organs.

(A) On the part of intestines.

LITERATURE.

Evans, W. E.: *Centralbl. f. Gynäk.*, 1885, IX, p. 525. Hofmeier: *Centralbl. f. Gynäk.*, 1885, IX, 11. Lee, W. H.: *St. Louis Med. and Surg. Jour.*, 1878, October. Schmidt, Benno: "Brucheinklemmung bei Schwangeren," *Zeitschrift für Med., Chir. u. Geburtskunde*, N. F., Vol. VI, p. 101. Rosner-Madurovicz: *Centralbl. f. Gynäk.*, 1886, p. 808. Winckel: "Lehrbuch der Frauenkrankheiten," 1886, p. 22-23.

Hard fæcal masses pressed down firmly into the small pelvis produce the same effect as contracted pelves; they prevent the engagement of the head, cause a faulty attitude of the child or prolapse of the extremities, render the examination more difficult and may lead to serious anomalies of the pains. Especially interesting, in this connection, is the case of Madurovicz-Rosner, of excessive fæcal accumulation with atresia ani vaginalis, in which the child presented in a transverse position; the examination was very difficult on account of the scybalæ, and version impossible, so that decapitation had to be performed. If it be impossible to empty the intestine with enemata, the scybalæ must be removed with the hand or a spoon, similar to the placental scoop.

Herniæ of the intestines are more important as complications of delivery. Hernia labialis posterior, anterior and cruralis are liable to be present. The first is very rare; I observed it once in a pregnant woman (see above), where it was reposited, and held *in situ* by a pessary. Unfortunately, the woman did not return to be delivered. A case of hernia vaginalis et vulvæ posterior was observed by Lee (see above) immediately after the delivery, and after reposition the woman was cured in three weeks by rest in bed.

Vaginal enterocele has been repeatedly noted as an obstacle to delivery; thus by Evans (see above). He reposited the intestines before the delivery, after which they ceased to be a source of obstruction. Should the reposition be impossible in the lateral or knee-chest position, in cases in which the loops of intestines pass from Douglas' pouch into the small pelvis, then the delivery should be terminated as rapidly as possible by operative interference, in order to shorten, as far as may be, any dangerous compression of the intestines. Afterward, their reposition should be effected under anæsthesia, and their retention must be secured by a large, round, moderately unyielding pessary.

Inguinal and crural herniæ may be forced down more and more during the delivery, and may endanger the course of the delivery by increasing the painfulness of the uterine contractions and by the laborious and even dangerous use of the abdominal muscles in straining. I have observed a left labial hernia, the size of a man's fist, where an assistant was obliged to hold back the intestines with both hands as much as possible during the second stage, when it increased very perceptibly in size, until the child was extracted with the forceps, and reposition and retention of the hernia by a properly adjusted bandage was again possible. Grenser (*Monatschr.*, Bd. xxv, p. 142) found a double inguinal hernia in a parturient, and was compelled to have them held back until he could extract with the forceps. This was also done in a case of a pretty large umbilical hernia which came under my observation once as a complication of labor. Grenser (*Monatschr.*, Bd. xxvi, p. 56) met with an umbilical hernia, the size of a fist, which was reposited and held back during labor.

I have also observed a congenital hernia of the left ovary in a parturient at Munich. It was impossible to reposit the ovary, which was not specially painful, was about the size of a walnut, did not delay the delivery at all and remained unchanged in the puerperium. Where, as in the case of Hofmeier, the ovarian hernia in a gravida should enlarge from an œdema of the sac and become very painful, ovariotomy would be indicated; the artificial termination of the labor would be indicated in a delivery complicated with such a tumor, with a subsequent ovariotomy, unless the œdema should subside and the small tumor become capable of being reposited, when a truss would suffice.

Inversion of the rectum with well-marked prolapse occurs sometimes in puerperal women; the patient should be placed on her side, the rectum reposited, straining prohibited and the prolapse held back, while the perineum is supported; this should be repeated while removing the placenta.

If one of the above-mentioned intestinal herniæ should threaten to arise during labor, the indication would be to place the parturient in the lateral position, to forbid bearing down and to complete the delivery as rapidly as possible, under anæsthesia, in order to prevent this unfortunate occurrence as far as possible.

(B) On the part of the kidneys of the gravida.

LITERATURE.

"Aerztlicher Bericht des k. k. Gebär- und Findelhauses zu Wien v. J. 1858," Wien, 1860, p. 29. Fischel: *Prager med. Wochenschrift*, 1885, No. 25.

An obstruction to delivery may be caused by a faulty position of one kidney, if it descends so far into the small pelvis that the latter is narrowed. The only case of this kind has been reported by Fischel.

"On the posterior wall of the pelvis, to the left of the promontory, was a tumor, the size and shape of a small kidney. Its lower curved border extended down to the great sacro-sciatic notch, its upper border was concave, resembled a hilus and the pulsation of a large vessel was felt in it. The woman had already had transverse presentations of the child in her first and third confinements, probably in consequence of this tumor. In the thirty-fifth week premature labor was induced, the right arm prolapsed and was reposited, a full bath was given and a living child born, 44 cm. long, 2455 gm. in weight. Puerperium normal."

In the above-cited Vienna "Berichte" a rupture of the uterus in a Vpara is described, where the delivery of a dead child was accomplished by means of version and extraction. The post-mortem of the puerpera revealed, besides a longitudinal tear on the posterior portion of the cervix, a cyst of the right kidney, the size of a child's head (on which the occurrence of the uterine rupture might possibly depend.—AUTHOR). Nothing more than what is stated was given concerning this case.

If such a tumor were movable, reposition should, of course, be done and the tumor retained in this situation by the prone position of the parturient on the opposite side. In a case of twins, I have felt both kidneys alongside of the uterus, like tumors; they were movable, but did not descend low enough to cause any obstruction to the delivery.

(C) Rupture of the spleen.

Ruptures of the spleen, as causes of the sudden death of the parturient, will be considered in connection with the latter (see page 599).

I do not know, whether leucæmic tumors of the spleen, which, in the years of fertility, may reach down to the pelvic inlet, have ever led to dystocia.

(D) Tumors of the liver.

LITERATURE.

Friedreich: *Virchow's Archiv*, XXXVI, 465, 1886. Schwing, K.: *Centralbl. f. Gynäk.*, 1881, V, 308–311. Senfft: *Würzburger med. Zeitschr.*, VI, 3 and 4, 1865.

Tumors of the liver, large hydatid cysts and carcinomatous tumors have been described as complications of labor. We have already spoken of the former; in Sadler's case (*Med. Times and Gaz.*, August 6th, 1884), the large hydatid cyst of the liver was mistaken for an exostosis of the sacrum and the Cæsarean section was performed.

The cases of carcinoma of the liver which have caused obstruction to delivery have been published by Senfft, Friedreich and Schwing. They show that pregnancy may be interrupted by the rapid growth of the tumor (in the seventh month, *Senfft*), but may at times go to term (*Friedreich* and *Schwing*); that, further, the tumor is capable of preventing the passage of the head through the pelvis by occluding the pelvic inlet (*Senfft*); that, finally, the child may be born, infected with cancer from the mother, for in Friedreich's case the cachectic child had a flat circular tumor on the left patella, the microscopic examination of which showed an alveolar formation similar to that of the maternal tumors. In Senfft's case, the tumor weighed eight kgm.; in that of Schwing, 14 kgm. In the former's case the patient died from hemorrhage arising from the torn vessels at the surface of the cancer.

(E) Rupture of the aorta during delivery, see page 600.

(F) Lastly, as one of the symptoms of various diseases of the abdominal and other organs, mention should be made of excessive vomiting of the parturient, especially among those who suffer from diseases of the kidney, from anomalies of the uterine contractions, and from gastric and hepatic diseases. In other cases the cause is only an increased reflex irritability, an abnormal rigidity of the cervix and a contracted pelvis with contusion of the wall of the uterus. The first indication is to find out the cause, the second is to set this aside as far as possible. When, however, neither one nor the other is possible, symptomatic treatment alone remains, and may consist of the local application of sinapisms to the epigastrium and of sedative enemata. Liquids should be restricted; internally, small pellets of ice may be given, or an ice-bladder applied to the epigastrium; small doses of narcotics may also be useful, or, finally, a small wineglassful of a weak cocaine solution. If everything fails, the artificial termination of the delivery will be indicated in the second stage.

CHAPTER II.

The Diseases of the Circulatory Organs.

The diseases of the respiratory and circulatory organs, and their condition during the puerperal processes, have been already discussed under the Pathology of Pregnancy (pages 261–265). We have only a few more remarks to make here. Hypertrophy of the heart, struma and exophthalmos may increase during pregnancy, as Benicke has observed (*Zeitschrift für Geburtshülfe und Gynäkologie*, I, p. 40), and yet pregnancy go to term and labor and the puerperium be normal.

In general, the course of pregnancy and labor in the case of goitre is, with few exceptions, favorable for mother and child. In the last five years in Munich there have been 24 cases of more or less marked struma (bronchocele) in parturient women. Twice it was complicated with exophthalmos; one of these patients was confined prematurely in the ninth month, the other went to full term; both of the mothers and the children recovered. Once a parturient with a large goitre was brought to me in extremis, the Cæsarean section was rapidly performed, but the child was extracted dead, and the mother succumbed in 5½ hours, although tracheotomy had been done. In another gravida, with a rapidly growing parenchymatous goitre, I induced premature labor with success. Mother and child left the clinic in a good condition; the former, however, died in a few weeks from another rapid increase in size of the goitre. Among 57 deliveries with goitre in the mother, five were terminated artificially, because of other complications (transverse presentation, contracted pelvis, prolapse of the cord), and there were besides the previously described cases. Altogether there were, therefore, 9, or 16 per cent. in which artificial assistance was required, only 2, however, or 3 per cent. on account of the goitre. 22 of the women were multiparæ; 4 were pluriparae; 56 of them were discharged, having passed successfully through their confinement. Of the 50 children born spontaneously, two were macerated and one stillborn (face presentation, twice the cord was coiled around the body, and once around the breech); the children's lives, therefore, were not endangered by goitre in greater proportion than usual. Besides the one macerated fœtus, only three were born from two to three weeks before term.

CHAPTER III.

Dystocia due to the Brain and the Spinal Cord.

LITERATURE.

Venn: *Centralbl. f. Gynäk.*, 1881, p. 100.

Meningitis.—Meningitis occurs in pregnant women in connection with facial erysipelas, and also independent of it, apparently without any external cause; but as we know now it is due to streptococci; its occurrence, to be sure, is rare. With the commencement of labor the general condition grows worse, the violent headaches pass into convulsions; the urine is and remains free from albumin during these convulsions—a fact to which C. Von Braun has called special attention ("Lehrbuch," p. 491). In a case of old tubercular meningitis, which Hecker described (*Klinik*, 1, p. 183), the excitement increased during pregnancy, and with the beginning of the pains the restlessness during the unconsciousness became so great that a living child was delivered by accouchement forcé, the mother having been given up as lost. F. Benicke likewise found his patient's urine free from albumin and casts; the child was fully developed. Although the temperature during the delivery did not rise above 100.7° F., and the second stage was easily completed with the forceps, and the patient afterward had a temperature of 99.3° F. and pulse of 124, pulmonary œdema increased rapidly after the confinement, the temperature rose above 104° F., and the puerpera died in 9½ hours. The post-mortem revealed pachy- and leptomeningitis, pulmonary œdema, capillary bronchitis and parenchymatous hepatitis. The child, also, was seized with convulsions on the second day, and died of them on the third; at the post-mortem purulent leptomeningitis was likewise found.

Very interesting are the observations of

Deliveries Complicated With Chronic Affections of the Spinal Cord.

LITERATURE.

Benicke: *Zeitschrift f. Geburtsh. u. Gynäk.*, I, 1877, p. 28. Bernays, A. C.: "Contribution to the physiology of parturition in a case of labor during paralysis," *St. Louis Med. and Surg. Jour.*, 1883, XLV, 549. Epley, F. W.: "A case of painless labor in a patient with paraplegia," *New York Med. Jour.*, 1883, XXXVII, 233. Helffi: *Monatsschrift für Geburtskunde*, IV. Litschkus: *Wratsch*, 1885, No. 17; *Centralbl. für Gynäk.*, 1885, 620.

Deliveries in cases of tabes dorsalis and paralysis of the lower extremities have been observed by Brachet, Nasse (1837), Merriman, Chaussier, Scanzoni ("Lehrbuch," III, p. 501), Meringe, Birkerod, Obernier and Macdonald, and have been free from any disturbance. In Litschkus' case the labor is said to have lasted five days, and he attributed the very prolonged first stage to the disease of the spinal cord. One of the most carefully observed cases is that of F. Benicke, in which a chronic myelitis of the whole cord with paraplegia and anæsthesia of the lower extremities, extending as high as the umbilicus, occurred during the ninth pregnancy. With this was associated a chronic inflammatory process of the seventh dorsal vertebra, together with painful contractures of the paralyzed muscles and an increased reflex irritability of those parts of the cord which were situated below the interruption. Labor proceeded without the patient experiencing the trace of a pain. The cry of the child was the first thing to call her attention to it. It was fully developed, 51 cm. long and 3340 gm. in weight. The placenta was expressed without the patient feeling it, and the uterus contracted well. This organ had, therefore, expelled its contents without any assistance from the abdominal muscles by straining.

SECTION IV.

General Diseases and Death of the Parturient.

CHAPTER I.

Fever.

Since we know that an aseptic fever may exist with a thoroughly good condition of the patients, and that the latter are capable of traveling long distances without injury, and since we know further that temperatures of 106.7° to 107.6° F. may be endured for hours by pregnant animals (provided the process of heating is slow) without danger to the maternal animal and the fœtus, we shall be unable to discern in such an elevation of temperature, in and of itself, any danger for the parturient and her child, although the fœtus is naturally even warmer than the mother. Since, however, the consequences of increased tissue changes, especially the augmented nitrogenous waste and the subjective symptoms are usually present in the febrile elevations of parturients, we shall rarely dare to think of an aseptic fever. But if the fever associated with these symptoms develops more and more, if it is almost always infective, and if the cocci found with it almost without exception pass through the placental circuit from the mother to the child, then it will always be our duty, even in a mild grade of infectious fever, to remove the fœtus as soon as possible from this dangerous influence. If this is no longer feasible, we should at least seek to protect it by means which, in a measure, prevent the development of the carriers of infection.

Consequently, in my opinion, a temperature of 101.3°–103.1° F. is a sufficiently important indication to artificially terminate the delivery, as soon as the necessary indications are fulfilled, provided we find it associated with albuminuria or an increased elimination of urea or disturbances of the subjective state of the patient. We are forced to do so, not only from considerations for the life of the child, but also for that of the mother. For we know that fever patients, making strong muscular efforts, require much more material than they do without such efforts ; the shortening of the delivery can, therefore, only be beneficial for the parturient. As a rule, indeed, the indication is already to be found in the disease proper (eclampsia, erysipelas, contracted pelvis, laceration), sometimes these and not the fever chiefly require our decision concerning the treatment. Besides these, there are still other cases, in which we have to lower the temperature, without having been able to find a cause for the fever, and also where a sudden elevation in the temperature demands treatment, before we can consider its cause.

In illustrating these statements from my own experience, I find from 1 to 3 per cent. of all parturient women are feverish during labor. The highest temperature which I have observed in a parturient was 105.8° F. If I were to consider only temperatures above 103.1° F., only 21 cases came under observation in about 7000 deliveries; I have already reported on the earlier ones; multiparæ were, probably accidentally, more numerous among these than primiparæ. The positions of the children were: 3 footling presentations, 1 transverse, and 17 vertex presentations; other complications were: placenta prævia (once 104.4° F.), 4 of the mothers died in the puerperium, 11 of the children succumbed (4 of them were perforated). Pelvic contraction and infection at the time of labor play the most important parts. Besides, there are to be enumerated syphilis, anomalous pains, hæmatoma of one lip of the cervix, bronchitis, pleuritis, albuminuria, and rupture of the uterus. The very remarkable fact, however, appears that a fall in the temperature often occurs at once and very rapidly, precisely in those who are most feverish and in whom we should assume that we had most certainly to deal with an infection during labor; thus, for example, one woman who had a temperature of 105.9° F. immediately after the spontaneous termination of a premature delivery, remained entirely free from fever in the puerperium and was discharged on the 10th day. In another, who had an elevation of 104.9° F. during labor, the highest temperature in the puerperium was 100.9° F.; a third, who had a temperature during labor of 105.6° F., preceded by chills and pyæmic symptoms, recovered rapidly in puerperio in spite of a moderate exudation, so that it often appeared to us as if the morbid condition was at once cut short by the puerperal processes, or even by the termination of labor.

The means, which we have at our command for controlling high temperature in the first stage of labor, are external and internal. Among the external we enumerate: lukewarm full baths, from 77°–86° F., cold packs, and the application of the ice-bladder, especially to the head and other painful spots. Sinapisms sometimes cause a high temperature to fall. Leiter's coiled tubes are likewise very useful. Local applications and the ice-bladder may be applied permanently; the bath may be given from time to time; of course, taking care not to allow the parturient to be confined in the bath.

The internal remedies are: Antizymotics and antipyretics, quinine and eucalyptus when the fever is of a distinct type, antipyrine and salicylate of sodium in rheumatic fever. I specially advise the use of antifebrine and phenacetine (0.25–0.5) as least depressing to the heart in those fevers in which a positive diagnosis has not yet been made.

CHAPTER II.

Disturbances of Labor due to Convulsions and Coma: Eclampsia.

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Definition.—By puerperal eclampsia we understand convulsions which are associated with loss of consciousness and recur at longer or shorter intervals. Many theories have been advanced in explanation of the convulsions, but so far it has not been possible to establish with any certainty the poison to whose entrance into the system the disease is to be ascribed. The reason for this want of success probably lies in the fact that, as a rule, a single cause has been sought for to account for all cases; only in recent times has consideration been given to the possibility that a number of different causes or various poisons may produce almost the same group of symptoms. We must here briefly enumerate the most important theories concerning the origin of the disease, without entering on their minute refutation, since they all are to-day, in fact, obsolete.

1. First of all there is the theory of Th. Frerichs, that eclampsia is uræmic, and is produced by the urea retained in the blood. This is untenable, because in many cases—we have noted several in our clinic—absolutely no retention of urea could be found in the most important organs, especially in the liver and the muscles; on the contrary, these contained less urea than ordinarily; because, further, in those cases of eclampsia which recovered, the amount of nitrogen excreted in the urine was only equal to the minimum quantity excreted in a state of absolute hunger (*E. Voit* and *M. Stumpf*).

2 For the same reasons, the attempt to save Frerichs' theory by ascribing the condition to the ammonia, an ammoniæmia, which is said to originate from the retention of the urea by means of some ferment, could not be successful. Although Petroff thought he had verified this theory by the discovery of relatively large quantities of ammonia in the blood of eclamptic patients, injections of carbonate of ammonia into the blood, even after ligating the ureters, showed that short convulsions were produced which had no further bad effects (the same effects were produced by carbonate of sodium), and yet no actual depression of the nervous system was caused by this salt. Spiegelberg, in 1870, proved, by a careful examination of the blood in a case of eclampsia at the seventh month of pregnancy, that it was rich in ammonia, and at the same time contained much urea (instead of 0.016 : 0.055), and that there was very little urea in the urine. He also, by the injections of carbonate of ammonia into the blood of dogs and rabbits, produced convulsions and coma, thus confirming the results of Petroff, and thereby sought anew to trace a part of the cases of puerperal eclampsia to ammoniæmia. On the one hand, however, the examinations of the normal amount of urea and ammonia contained in the blood and its fluctuations are not sufficiently numerous, and, on the other hand, the convulsions evoked in animals by the injections mentioned are by no means to be accepted as the result of the ammonia alone, since they, as stated above, may also be produced by the injection of solutions of carbonate of sodium.

After the defects of the above-mentioned hypothesis had been well established experimentally, Traube, Munk and Rosenstein asserted that the
3. hydræmia of pregnancy furnished the predisposition to eclampsia; that it was

produced, however, by the pains alone, which so increase the pressure in the aortic system that œdema of the mid-brain may thereby be effected and be followed by anæmia, and when the latter reaches a certain degree convulsions and coma ensue. So long as I had not accumulated the numerous observations which I have made in Munich in the past four years, and depended entirely upon the statements of other authors, that the eclampsia was almost exclusively excited by the activity of labor, whether prematurely or at full term, I was a supporter of this Traube-Munk-Rosenstein theory. But apart from the facts that the hydræmia is not specially marked in many cases of eclampsia, and that the anæmia of the mid-brain is by no means pronounced, the observation that quite a number of cases of eclampsia occur during the course of pregnancy in the absence of any pains or other causes, proved sufficient to cause me to abandon this theory also.

According to the experiments of L. Landois, an abnormal hyperæmia, par- 4
ticularly a venous stasis of the parts lying between the corpora quadrigemina
and the spinal cord, appears likewise to be able to produce epileptiform 5
attacks. Galabin believes a suddenly occurring anæmia of the gray cortical
substance of the cerebral hemispheres to be the cause of the outbreak of the
convulsions, and that most probably the circulation of some deleterious
material in the blood is the primary cause of the eclampsia and the albu-
minuria at the same time, but that it is incapable of causing convulsions
unless it has given rise to nephritis (?). The infrequent instances of puer-
peral convulsions in the absence of any disease of the kidneys are said to be,
in all probability, cases of epilepsy.

But since the symptoms again and again lead to the belief in a poisonous
material originating in the body itself, and since the diminished excretion
of the urine certainly plays an important part (Halbertsma ascribes this to
compression of the ureters), because the danger lessens perceptibly from the
moment when the amount of urine voided is markedly increased, Fleischer,
of Erlangen, conceived the idea that the cause must lie in the extractive 6
materials present in the urine, and he believes that he has proved them to be
dangerous poisons for the body, by his experiments on the lower animals.
Many facts are opposed to this supposition. First of all, I have found in a 1
number of post-mortem examinations made on pregnant women, that the
ureters may have been greatly distended without a trace of eclamptic symp-
toms having been present. Besides, his conclusion is based on the assump- 2
tion, which is certainly fallacious for many cases, that the change in the kid-
neys or the diminished excretion of urine is the primary factor, and that the
rest of the symptoms can only be the consequence, and, although there are
positive authentic cases on record in which albuminuria was wholly absent, it
fails to recognize the possibility, which is not to be ignored, that the kidney
disease may likewise be a result of the preëxisting poisoning, as are the con-
vulsions and the coma; in the same way as acute yellow atrophy of the liver

occurs in phosphorus and arsenical poisoning, as it does in eclamptic poisoning (two cases have been demonstrated by Stumpf in our clinic). Battlehner has consequently conceived the idea that a product of decomposition resembling the ptomaïnes, which is generated in the body during life, may be the cause of the eclampsia. This would assume a bacterial origin for the whole disease—a supposition previously maintained. This, however, is rendered very improbable by the fact that eclampsia has always occurred sporadically, never epidemically; Delore, it is true, has asserted the latter to be the case, but has not been able to prove it. Doléris and Poney alone maintain that among five eclamptic cases they have found two with nephritis due to micrococci, in which the infection of the blood increased and diminished pari passu with the eclamptic attacks. All of the examinations of other authors, however, have, as yet, proved negative.

7 Prof. Stumpf has been uniformly successful in finding acetone, with and without distillation, in the urine of eclamptic patients, whose breath smells strongly of acetone. He, considering the part which acetone and bodies allied to it are said, according to recent interpretations, to play in diabetic coma, sought for sugar in the urine of eclamptic patients, and, in fact, found it in all of the cases where a sufficient quantity of the urine could be obtained to make the tests for sugar. Stumpf, therefore, formed the opinion that under abnormal processes of decomposition, a substance free from nitrogen, toxic in its action, perhaps acetone, or a body resembling it which reacts to the same tests, may be formed, which produces by its excretion an irritation of the kidneys that may eventually lead to a nephritis, has a destructive effect upon the coloring matter of the blood, greatly alters the activity of the liver-cells, causes sugar to appear in the urine and produces the destruction of the parenchyma of the liver, advancing to acute yellow atrophy of the organ with the formation of tyrosin and leucin, and induces coma and convulsions from an irritation of the brain.

Stumpf correctly disclaims the view that this explanation would be suitable for all cases, because icterus is by no means frequently present in eclamptic patients; he leaves it undecided whether this material is produced by an infectious agent introduced into the body from without, or whether it may not have been transmitted from the child to the mother—an idea never before entertained. The predisposition to eclampsia in twin and triplet pregnancy, its fatal effect on the child, the fact that dead children in rigor mortis have been extracted from eclamptic patients by Dohrn and Stumpf (from which we may conclude that possibly intense muscular spasms may have preceded the death of the child), and finally, the fact to which I have directed attention, since 1865, with reference to the prognosis, that with the death of the child during pregnancy the danger for the gravida is much lessened or entirely overcome (see my "Berichte und Studien," 1, p. 288)—

all point to the intimate relation which exists between the mother and the child in regard to the origin of eclampsia.

That is the state of the question to-day; it is by no means as yet settled. It follows, however, from all of these investigations, that there are not only very great differences in the degree of intoxication, but probably also various poisons, or, at least, one poison arising in different ways in the body of the pregnant woman, which may be the cause of this severe disease. The facts above given show in what direction the future course of investigation lies; first of all, exact examinations of all the organs, secretions and excretions of the pregnant woman must again be made, for these are as yet far from being concluded, to be followed by the most exact analysis of the fœtal body, which has hitherto been very much neglected in this respect. Next in order are experiments on animals, which have frequently led us in the wrong direction by undue haste in the interpretation of this disease.

It still remains to group together the facts which have been ascertained in the course of years, as predisposing and exciting causes of eclamptic convulsions. To these belong: 1. All chronic and acute diseases of the kidney, the recent kidney of pregnancy of a marked type and old inflammatory processes which have led to hydræmia and œdema; 2. Long and excessive retention of urine, such as may be caused by compression of the ureters in the small pelvis by a very large fœtus or much liquor amnii or twins; 3. Twin and triplet pregnancies are especially predisposed (of 627 deliveries with eclampsia 69 were twin pregnancies, that is, 11 per cent., instead of 1.1 per cent.); 4. Old and very young primiparæ with rigid muscle fibres, in whom the pelvic and other cavities are not particularly roomy. In general, primiparæ predominate decidedly over multiparæ, the ratio being as 3.3 : 1 (82.6 per cent. Ip. : 17.4 per cent., Schauta); 5. 23 per cent. of the cases occur in pregnancy, 60 per cent. during labor and 17 per cent. afterward (Schauta: 43 gravidæ, 185 part., 82 puerp). Staude found among 40 eclamptic cases in the Berlin Maternity Hospital 23 = 82.5 per cent. with albuminuria; 18 of the patients, or 60 per cent., had a conjugata externa under 19.5 cm., and in 30 cases with nephritis the children's heads showed a much larger diameter than did those born of 10 women with nephritis without any eclampsia. From this Staude concluded that a narrow pelvis and a large fœtal skull in the presence of hydræmia are favorable for the occurrence of eclampsia, by increasing the pressure which the head is liable to exert upon the vessels of the pelvis.

The states of the brain, which have been found at the post-mortem examination of cases of eclampsia, are: above all a high degree of anæmia with more or less œdema and flattening of the cerebral convolutions; marked hyperæmia leading to capillary apoplexies and apoplectic masses of the size of a pigeon's egg are much more infrequent, occurring only in about one-sixth of the cases. Hjelt found in the right corpus striatum a softening 4 cm. in diameter. Under the microscope, the small arteries of the brain were full of small aneurismal distentions of the tunica adventitia. An amyloid degeneration of the kidneys existed, without any albumin in the urine. The brain is very seldom entirely healthy (2–3 per cent.). In an interesting case, reported by Mendel, the first attack of eclampsia, with subsequent aphasia, occurred in the first puerperium and disappeared, the patient apparently making a complete recovery; on the seventh day of the second puerperium eclampsia again occurred without any œdema or albuminuria, but with a high temperature, and death ensued under general convulsions; the post-mortem revealed a scar and a cyst, the residue of a previous extravasation of blood; recent meningitis; heart and kidneys normal.

The direct cause of the outbreak of eclampsia may lie in the suppression of the natural evacuations (fæcal and urinary), or in very painful uterine contractions, especially those caused by the painful distention of the external os or of the vulva; they may also be caused by very strong muscular efforts, as in violent straining of the abdominal muscles; sometimes a firm grasp of the uterus, such as is used in removing the placenta, suffices to call forth a new attack. The frequency of eclampsia is placed at 0.25 per cent. of all deliveries (*Schauta*).

Symptoms.—Puerperal eclampsia either occurs quite suddenly or after premonitory symptoms, such as severe headache, stupor, and a condition of debility, have preceded it for a little while. At the moment when the convulsion of the muscles of the face, extremities or body begins, consciousness disappears, the face becomes cyanotic, violent clonic spasms of the orbiculares palpebrarum et oris, of the sterno-cleido-mastoid and of the diaphragm appear. The respiration is hurried, then becomes slower—gasping, blowing, groaning; froth, mixed with blood from the bitten tongue, escapes from the mouth; the eyeballs are rolled up, the pupils variable, at the beginning often very wide, often contracted; reflexes are absent, the sensibility of the skin and muscles is diminished. The attack lasts ½–1–1½ minutes, then the spasms subside, the respiration becomes more regular, the cyanosis disappears and the patient lies in a deep coma. P. Bar established the curve of such an attack on the right biceps of an eclamptic woman; it lasted 77 seconds and had three periods. In the commencement stage of 7 seconds there was a series of oscillations, then followed the tonic stage, which reached its maximum in 8 seconds, lasted 11 seconds and in 3 seconds subsided; then came the clonic stage, of 45 seconds' duration, at first rapid, severe shocks, then subsiding irregularly. Abortive attacks occurred frequently.

If no new attacks occur, a certain amount of restlessness appears after a time, the patient groans when touched, she gives a start if the skin is quickly or roughly touched, complains of pain, recovers consciousness and is ignorant of what has happened to her. As a rule she feels pain only in her head and a soreness in all her limbs. The pulse is small, very frequent, and the temperature rises decidedly with every new attack, sometimes above 104.3° F. This fact, first established by me, has been confirmed by Bourneville and Budin, of Paris. In the intervals a continuation of the clonic muscular spasms may be observed (*Valentin*).

The attacks recur at variable intervals, according to the effect produced by the therapeutic measures; sometimes they are very regular and return in from 1–2 to 3–30 days. The largest number I have observed in cases which recovered was 18 (Triaire, see above, 28).

The recovery is marked by a decline in the duration and intensity of the paroxysms and by the patient's falling into a quiet, deep sleep. The fœtus suffers decidedly by the attacks, for sometimes, *e. g.*, in twins, a single attack suffices to kill one of them; in other cases, on the contrary, a large number of paroxysms may be passed through without serious injury to the child. It is a remarkable fact, to which I first called attention, that, if the fœtus dies as a result of the attack and the pregnancy is not at once interrupted, the onset and course of labor are generally free from convulsions. After eclamptic attacks, amaurosis has repeatedly persisted for some time (*Weber*). Furthermore, maniacal conditions have been observed during and after the eclampsia, and the weaker and fewer the attacks, so much the less intense was the mania (*Fritz*). Death may supervene either during an attack or in the comatose stage, from œdema of the lungs and cerebral apoplexy, or some days later from puerperal processes.

Since the patients know nothing about their condition, and since the birth may occur during a state of complete unconsciousness, it has happened that they refused to acknowledge the child presented to them as their own.

The distinct prodromata which precede the first attack in more than one-fourth of the cases, such as headache, nausea, dizziness, scintillation before the eyes, amblyopia, amaurosis, pain in the epigastrium, vomiting, depression of spirits, laughing, weeping and loquacity sometimes again terminate the process, and, when these subside, the appetite improves, the skin becomes moist, diuresis increases, sleep becomes refreshing, and the conviction slowly comes to the patient herself that she has escaped a serious illness.

In regard to the condition of the kidneys during the eclamptic attacks, there are quite a good many cases in which they are not diseased; they amount to more than one-third of all cases. As a rule, however, the urine contains—in 84 per cent. of the cases—a greater or smaller quantity of albumin, as much as 2.5 per cent. This albuminuria increases with each attack; after the latter ceases the amount of albumin usually sinks very rapidly in proportion to the rapidity of increase in the quantity of urine. Besides, the urine of eclamptic cases, even before the attacks, as proven by Stumpf, contains constantly much more sugar than the ordinary urine of pregnant women. Its reaction, also, is decidedly acid, retaining this reaction for days even in midsummer, and finally, with the commencement of the polyuria, a large sediment of urates occurs, which disappears after 4–6 days; a few times leucin and tyrosin have been found in cases ending fatally with icterus. Of formed elements, fibrinous casts are found most frequently, then red and white blood-corpuscles. The diseased kidneys were found to be hyperæmic and swollen, the cells of the convoluted canaliculi irregularly shaped, and filled with albuminoid masses and sometimes with droplets of fat; in the medullary substance the fatty infiltration was in places well marked; usually only the symptoms of acute congestive catarrh of the kidney could be made out, and the symptoms of a diffuse interstitial nephritis were discernible in but one-third of the cases.

Regarding *the course of labor* it may be remarked that premature delivery occurs as a rule in those cases in which the eclampsia sets in during pregnancy, and that the irritation of the sensory nerves concomitant with it is liable to increase the severity of the attacks. The duration of labor, and especially that of the second stage, is, however, decidedly shorter than usual, although by far the greater number of the patients are primiparæ. Stumpf has, finally, pointed out some other striking facts gleaned from our material, viz., the occurrence of multiple hemorrhages under the skin as large as the palm of the hand, with and without subcutaneous injection; prognostically, these have a very bad significance; also a markedly increased patellar reflex and great susceptibility to the irritation of light. In one of our cases a psychosis (ideas of persecution) broke out after the attacks (18) ceased; we were compelled to send the patient to the insane asylum, from which she was discharged cured after five weeks. In another case a complete loss of memory (?) lasted until the patient's discharge.

The *diagnosis* must first of all be made between eclampsia and epilepsy. If we cannot learn from the attendants whether the patient had had such convulsions before her pregnancy, we must carefully watch the course and the effects of the convulsions upon the mother. The intensity of the comatose stage is said to be greater in eclampsia than in epilepsy (?). In hysterical convulsions consciousness is usually retained; the contractions are less severe; the comatose stage is absent; the patients scream, weep or laugh during the attacks.

A confusion of eclamptic convulsions with those caused by meningitis has happened to me once in a pregnant woman. In the latter disease the attacks are seldom so general, do not return so regularly; they constitute rather gradually increasing, irregular contractions of some groups of muscles. Moreover, fever usually precedes the attacks for some time, the patients have previously been forgetful and somnolent; yet the difference is by no means always marked. Fritsch, of Breslau, has likewise witnessed the same mistake (*C. f. Gynäk.*, 1882, p. 842).

Above all, however, the previously described condition of the urine deserves the greatest attention, and there could be no doubt as to the disease, if we find oliguria, albuminuria, casts, marked acidity and sugar; the collective picture of this is so characteristic that mistakes occur very seldom.

Prognosis.—A gravida, who is suffering with marked albuminuria and has casts in her urine, is in great danger of becoming eclamptic from the moment in which the quantity of urine perceptibly diminishes. The danger decreases with the increase in the amount of urine and the diminution of the albumin. The death of the child, occurring as a consequence of the attacks, improves the prognosis, as does also the occurrence of profuse sweats. Schaute repeatedly established the fact, that all the disturbances, even those of the kidneys, declined after the death of the child in eclampsia of pregnancy. The prognosis is most unfavorable when the eclampsia breaks out at the commencement of the first stage of labor, is the more unfavorable the more severe and rapidly the attacks follow each other, and the later the patient comes under the care of the physician.

The prognosis is best where the first outbreak of the eclampsia occurs in the puerperium. Although formerly about 35.1 per cent. of the cases of eclampsia of pregnancy and labor (of 333 cases 117: Hugenberger) and only 20 per cent. of those who were first attacked in the puerperium (Schauta found 63.5 per cent. of recoveries, 36.5 per cent. fatal cases) succumbed, the prognosis has been very materially improved in the last decade by the treatment about to be described. When such patients come under our treatment now, after having had one or more attacks, we lose only from 7 to 10 per cent. On the other hand, the prognosis for the children is very bad, and will probably remain so; 77 per cent. of them die, 23 per cent. are saved, though a large proportion of the deaths are due to the premature delivery. According to Schauta, only 24.3 per cent. of the children succumbed.

Treatment.—During the past ten years I have gradually brought the treatment, about to be described, into thorough systematic practice in my clinics; in 1881 I was so convinced of its great advantages that I caused my assistant, Dr. Tittel, to make a comparative tabulation of the results of the treatment of eclampsia by the various methods; this was published at the time (see above). During the past twenty-two years I constantly gave to every pregnant woman who had any notable albuminuria, pills of ext. aloes with ext. colocynth. āā 1.5 gm., 30 pills, 1–3 pills each morning; this is done to produce free watery evacuations, and warm baths are also used as adjuvants. Porter in 1873 advised wrapping the patient in a cold-wet sheet, when the skin was dry and harsh; when it was soft, the use of hot wet sheet and woollen blankets. Jacquet, of Berlin, has tried this method with good success. To Breus belongs the chief merit of having introduced the energetic induction of diaphoresis by means of hot baths and packs in the treatment of eclampsia. Our successful results with his method of treatment have been sufficiently emphasized by Stumpf. A hot bath at 100° F., given every day, the patient afterward being wrapped in a blanket, causes diaphoresis, which usually continues two hours; it removes existing attacks and enables the gravida to go to term, without injury to the child. If this treatment fails to improve the patient's condition quickly, or if the oliguria is extreme, I combine the baths with the internal use of drastics.

If, in spite of these measures, an eclamptic attack occurs, I treat it exclusively with chloral hydrate, in doses of 1–2 gm. per enema, and with inhalations of chloroform. Whenever the patient becomes restless, and the approach of an attack is thereby recognized, or as soon as the first contractions commence, chloroform is to be given and the inhalation continued until the attack disappears. The chloroform acts, therefore, as a preliminary calmative until the chloral can be given, which is to be at once administered after each attack per enema, being dissolved in water or in a decoction of salep; this is repeated after each attack, and we are not afraid of giving as much as 12 gm. of this drug per day, and even more. Under this chloral-hydrate treatment alone, only seven fatal cases occurred among 92 of eclampsia (*Tittel*, loc. cit.).

I have long abandoned the use of venesection; even when used symptomatically on the occurrence of pulmonary œdema, it cannot allay the weakness of the heart muscle, but rather increases it.

Since Brummerstädt had already proved that the premature operative termination of labor in eclampsia is unfavorable, the proposition of Löhlein to induce premature labor in such cases is to be considered as obsolete, because it is irritating for the mother and dangerous for the child, and especially because the results of the diaphoretic method are so excellent. As soon as the indications for a rapid completion of the delivery are fulfilled, that is to say, in the second stage, we should not hesitate to perform it at once; before this, however, it is unwarrantable. All operations, even the removal of the placenta, must, of course, be done under complete anæsthesia. The after-treatment consists of absolute rest and quiet; light, digestible, liquid diet; diaphoresis, and the renewed use of hot baths in case the albumin does not diminish and the amount of urine becomes smaller. Cold cloths or the ice-bladder on the head may be used for the alleviation of the headache. The child must under no circumstances be nursed by the mother.

Formerly I could say that none of the other methods of treatment equalled the results of the one just described. In corroboration I referred to the work of Tittel, in which it is shown that 57 per cent. succumbed with the morphine treatment (!). This has changed decidedly since the publication of G. Veit's paper on the treatment of eclampsia. Probably nobody has used such heroic doses of morphine as G. Veit, who injected 0.03 gm. subcutaneously with each attack, and in 4–7 hours gave as much as 0.20 gm.

In our last case, in which four attacks had already occurred outside of the house, we injected during the next six attacks, on the same day, four times 0.03 gm., twice 0.015 gm., altogether 0.15 gm. in twelve hours; the patient recovered rapidly. G. Veit has lost only two out of more than 60 patients (3.3 per cent.). Further observations must show whether the morphine treatment will permanently displace that by chloroform and chloral hydrate.

Chloroform alone, uncombined with chloral, does not answer the same purpose, and bromide of potassium, which Collin has again specially recommended, is much too weak.

In conclusion, I should like to warn especially against pilocarpine. This drug had scarcely been discovered, when it was employed in the treatment of eclampsia. At the time, immediately after the publication of the cases of Schramm and Klotz, I pointed out the fact that the effect was rather the opposite of good, and I consider its use as contra-indicated, for the reasons that the results are so favorable with chloroform and chloral hydrate in eclampsia, that the action of pilocarpine on the heart is so depressing, and that the bronchial secretion, which is so greatly increased in consequence of the congestion of the lungs, increases the danger of pulmonary œdema. Time has confirmed my opinion; after many observers have unfortunately shown how dangerous its use is in eclampsia, it has finally been stricken from the list of remedies employed against this disease.

If death occur in eclampsia and the child be still living, laparo-hysterotomy in mortua should be done at once. My friend Beckmann, of Lütz, thus saved a child's life, and my assistant, Dr. Osterloth, also brought a living child into the world out of a dead mother; unfortunately, it died 27¼ hours afterward ("Berichte und Studien," Bd. II, p. 86, No. 915, 1874).

CHAPTER III.

Sudden Death of the Parturient During Labor.

LITERATURE.

Braun, G.: *Wiener med. Wochenschrift*, 1883, Nos. 27 and 28. Dunlap: *Jour. Amer. Med. Asso.*, Chicago, 1887, IX, 330. Dowden: *Med. and Surg. Reporter*, Philad., 1882, XLVII, 697. Hanson, W.: *Med. Age*, 1884, No. 15. *Centralbl. f. Gynäk.*, 1885, p. 271. Harvey, W. S.: (Death by apoplexy) *Clinic*, Chicago, 1885, VI, 152. Hauck, R.: "Der plötzliche Tod der Mutter während der Geburt," Greifswald, 1885. Heinricius: *Centralblatt für Gynäkologie*, 1882, p. 822. Lydston, G. F.: *Amer. Jour. Obst.*, New York, 1885, XVIII, 465–468. Lusk, W. T.: *Jour. Amer. Med. Asso.*, Chicago, 1884, III, 427. Netzel: *Hygeia*, 1879, June. Schwing: *Centralbl. f. Gynäk.*, 1880, IV, 291.

I have already, in the course of my remarks, had occasion to mention many causes of sudden death in parturient women. I call to mind only hemorrhage from premature loosening of a normally attached placenta and placenta prævia, eclampsia, apoplexy, rupture of the uterus, suffocation from struma, heart failure and air embolism (in contracted pelvis, carcinoma of the uterus and others). Some of the rarer causes still remain to be mentioned. It is not always possible to ascertain accurately the cause even at the autopsy, especially in the absence of embolism, of rupture, or of fatty degeneration of the heart (case of *Netzel*). Rupture of the aorta during the delivery is extremely rare; only one case is reported. It was observed by Heinricius; the rupture occurred in the aorta, 1½ cm. above the valves, in a 38-year-old healthy IIIpara with a child weighing 4500 gm. Death was instantaneous; within five minutes the asphyxiated child was retracted, but was soon resuscitated. The hemorrhage had taken place into the pericardium. The second stage, up to the time of death, had lasted only half an hour.

Ruptures of the spleen in pregnant and parturient women are somewhat more frequent, but still very rare. Mathias Saxtorph said he had seen the spleen extensively lacerated by the labor-pains in a woman who died in child-bed. J. Y. Simpson (*Edinb. Med. Jour.*, 1866, No. 135, p. 269) referred to three cases of rupture of the spleen in pregnancy, in labor and in the puerperium, which he explained by the extreme degree of leucocythæmia present during pregnancy, as a result of which the spleen became softer, larger and more easily injured by traumatism and muscular efforts. Wilson observed a case of rupture of the spleen immediately after labor; Sidney, one in pregnancy, where the rupture took place in stretching over backward; death was instantaneous. Hubhardt (*New York Med. Jour.*, 1879, July) found in a puerpera, who died eight hours after a labor lasting 40 hours, a spleen characteristic of intermittent fever, which was 25 cm. long, 15 broad, 2 kg. in weight, and had on its anterior surface a gaping tear 15 cm. long by 6.5 cm. wide, the edges of which were jagged; it had probably arisen toward the end of the delivery.

In a pregnant woman who had suffered for a long time from hysterical and epileptic attacks, who most probably also had a malarial spleen 19 cm. broad and 11 cm. long, and who died half an hour after her admission into the Prague clinic, Schwing found on the surface of the spleen that the capsule was separated from the pulp to the extent of the palm of a hand and was torn, that the spot corresponding to this separation of the capsule was covered with blood clots, that the tissue was semi-fluid, violet-red and interspersed with three masses of extravasated blood as large as a nut; the heart was normal in size, relaxed, the muscular structure pale yellowish-brown and friable, the valves normal.

If J. Y. Simpson's idea concerning the origin of such lacerations were correct, then this would certainly be found to be a much more frequent cause of death. I can only agree with Schwing in the interpretation which he has given to such cases, that these lesions occur chiefly, if not exclusively, in large diseased spleens (malaria, typhus, other infections), associated with trauma (a thrust, blows, a fall) and great efforts at straining during labor; he himself, however, has never yet observed a similar laceration.

In all cases of sudden death of the mother, we should, of course, deliver the child as quickly as possible and by the shortest course, provided it be not dead. We should, therefore, proceed to extract with the forceps, or to deliver by the breech in a pelvic presentation; if the cervix is not fully dilated, we should choose the Cæsarean section rather than version and extraction or extraction alone, because the difficulties and delays cannot be foreseen.

CHAPTER IV.

Delivery After the Death of the Mother.

LITERATURE.

Reimann: *Archiv für Gynäkologie*, XI, p. 215.

The contraction of the uterus may continue some little time longer than the last contraction of the maternal heart. On this account, therefore, it is conceivable that an expulsion of the fœtus may be effected by the contractions of the uterus alone, if the obstructions are not too great and labor is already pretty far advanced; in other words, immediately after the death of the parturient and before any traces of decomposition are present. Reimann has proved by experiments on animals that the uterus may still contract regularly after death, that it probably often, perhaps always does so, and that it contracts under the sole influence of the normal temperature even when entirely separated from the body. Besides this, uterine contractions have been observed in the human uterus by d'Outrepont, Osiander, Hecker (in a Cæsarean section post-mortem), Braxton Hicks (in incomplete and complete prolapse of the uterus one hour after death); Arbeiter and Leroux have felt these contractions in their attempts to deliver (compare *Reimann*). That these contractions are still capable of expelling a fœtus, was observed in a pregnant doe that was accidentally killed; a few minutes after her death she brought a living fawn into the world. Finally, since it has been proven by experiments (*Reimann*) and observations (*Börner:* Loder's *Journ. f. Chirurgie*, Bd. I, p. 519), that the contractions of the uterus may last for an hour or more post-mortem, the expulsion of the fœtus is not always to be expected immediately after death, but may ensue some little time thereafter. In some cases, on the other hand, the post-mortem or cadaveric deliveries

PART VI.

OBSTETRIC OPERATIONS.

CHAPTER I.

Definition—Division—Frequence of the Operations in Hospital and Private Practice—Practice on the Manikin.

Under obstetric operations we understand every artificial act which is performed on or in the genitals of a woman to overcome a danger threatening the woman in labor or her child in utero. We divide the operations, about to be described, into *preparatory*, and those done *for the purpose of delivery*.

I. *The preparatory operations are used—*
  (*a*) for the premature induction of labor.
    1. Induced abortion.
    2. Induced premature labor.
  (*b*) for the overcoming of some obstacle to labor.
    3. Incisions into the cervix.
    4. " into the vagina.
    5. " into the external genitals.
    6. Turning by external manipulation.
    7. Turning by external and internal manipulation.
  (*c*) for diminishing the size of the child's body.
    8. Perforation.
    9. Cephalotripsy.
    10. Decapitation.
    11. Embryotomy.
  (*d*) for the reposition of prolapsed extremities.
  (*e*) for the removal of some danger threatening the child.
    12. Reposition of the prolapsed cord.

II. *The operations for the purpose of delivery are—*
  (*a*) The propulsion of the undiminished child.
    13. Expression of the child. Expressio fœtus.
    14. Extraction by the breech.
    15. Forceps operations.
    16. Extraction by means of a hook or fillet.
  (*b*) Extraction of the mutilated child.
    17. Extraction with the bone forceps, the cephalotribe or cranioclast.
  (*c*) Delivery through artificially formed passages.
    18. Laparotomy.
    19. Cæsarean section.
    20. Porro's operation.

(*d*) Removal of the placenta.

(*e*) Forcible delivery: Accouchement forcé.

Manual Extrac. of head - Ritgen's method.

The results will be highly interesting, if, before beginning with the description, we cast a glance at the frequency of the performance of these operations in obstetric hospitals and in private practice. Ploss, who has investigated the frequency of obstetrical operations in private practice, found (*Monatsschr.*, XXII, 35) that in almost every country the frequency of operation gradually increases. He concluded that this increase must in all probability be ascribed to the greater number of male obstetricians; that, further, more operations were performed in cities than in the country, and that the frequency of operation bore a direct relation to the relative number of obstetricians. For example, the frequency of operation was:—

In Saxony,	1828–1834	1.24
" "	1839–1841	1.17
" Electoral Hessia,	1836–1846	1.38
" " "	1842–1846	1.34
" Wurtemberg,	1824–1825	1.27
" "	1846–1856	1.19
" Baden (Upper Rhine District),	1843–1844	1.36–37
" " " " "	1849–1853	1.35

The statistics showed no special preference for any individual operation except forceps and placental operations, so that the above-described increase designated these two varieties of operations as peculiar to a higher civilization. The apparently weightiest point of his conclusions, yet one which was not without danger, was that with the increase in the frequency of operation the mortality of children born by artificial aid diminished, and that this greater frequency of operation was favorable to the mother. We should guard against concluding from this that those operations are not only justifiable, but even beneficial; such statistics do not reveal the manifold evil results which a single forceps operation may produce; they only take cognizance of the life of the woman.

This much is certain, that operations are more frequently done in private practice than is necessary; and if it were possible to establish accurately the results of all these operations, not alone as regards the life, but also as regards the future condition of the mother and child, then would we cease to designate the forceps in the hands of an unskilled operator as a harmless instrument.

In a collection of 100,000 labors, observed in the hospitals at St. Petersburg, Berlin, Dresden, Leipzig, Marburg, Munich, Würzburg, Prague, Vienna, Graz, and Laibach, 6555 operations occurred; that is, 1 to 15.2 labors.

The frequency of their employment was as follows:—

		In 100 operations.	In 100 labors.
1.	Forceps,	46.0 times.	4.6 times.
2.	Internal version,	17.0 "	1.7 "
3.	Detachment of the placenta,	13.5 "	1.35 "
4.	Extraction by the breech,	13.0 "	1.3 "
5.	Reposition of the cord,	2.8 "	0.28 "
6.	Induction of premature labor,	2.0 "	0.2 "
7.	Perforation,	1.9 "	0.19 "
8.	Cephalotripsy,	1.2 "	0.12 "
9.	Cæsarean section,	0.9 "	0.09 "
10.	Reposition of extremities,	0.8 "	0.08 "
11.	Incision of the cervix,	0.3 "	0.03 "
12.	Accouchement forcé,	0.21 "	0.021 "
13.	Embryotomy,	0.16 "	0.016 "
14.	External version,	0.12 "	0.012 "
15.	Extraction with the hook,	0.1 "	0.01 "
16.	Induction of abortion,	0.01 "	0.001 "
		100.00 times.	10.000 times.

The reasons for the performance of operations, which are not always indicated, lie partly in the fact that the operator has not sufficient patience; partly that the natural powers are undervalued, because they have not been thoroughly studied; partly in a willingness to yield to the demands of the family and the parturient, and undoubtedly in a regard for the midwife who has caused the physician to be called, because she considers operative interference necessary; and last but not least in this, that so many young obstetricians do not sufficiently comprehend the peculiar difficulties of obstetrical operations.

One can practice these operations on the cadaver as also on the manikin. Since the former is only possible in large maternity hospitals where there are many deaths among the recently confined, one is compelled to content himself with the manikin, which was devised, most probably, at the close of the seventeenth century by Guillemeau, Sen. This has been so much improved that it does almost as well as a cadaver. Practicing the operations on the pelvis of a woman who has recently died, still covered with the soft parts, has no advantage over practicing on good manikins, which contain both normal and contracted pelves, and in which the preserved body of a newborn child is used. Of late these manikins, which were formerly made separate for the back and the side positions, have been so perfected by B. Schultze, of Jena, that they serve alike for both. I have introduced into this an elastic uterus with cervix and vagina, and have thus produced a manikin which answers every purpose.

CHAPTER II.

General Requirements for the Performance of Obstetric Operations.

For the conscientious obstetrician, who has the welfare of the parturient at heart and only operates when he is convinced of the necessity of an operation, the following requirements suffice in general for the performance of any operation.

Before it is begun, the presentation of the child, its position in the pelvis, the period of labor and the condition of the maternal soft parts and the pelvis should be established by a thorough examination.

A very serious mistake is often committed because no attention is paid to the period of labor, as indicated by the external os; and many a slipping of the forceps, many a laceration of the cervix, many a tear of the uterus is attributable to this sad carelessness.

The same holds good of the position of the child in relation to the various portions of the pelvis. Whether the head has already engaged in the inlet of the pelvis or not, is by no means a matter of indifference; of still greater importance is whether the large fontanelle is lower down than the small one. It is self-evident that brow and face presentations with the chin directed posteriorly, and shoulder and breech presentations, should be carefully distinguished as such before one would dare to undertake an operation.

The obstetrician must next consider the general condition of the parturient (pulse, respiration, temperature) and of the child (fœtal heart sounds, caput succedaneum, condition of the liquor amnii) with the greatest care; for in every operation one has to decide above all things the question: Is a danger already threatening one or both lives or is it soon to be expected? Only by the affirmation of this question can the operator derive the indication for operative interference. An impartial examination should be made, with a careful consideration of every point; then the answer for the most part is simple. But one should guard against emphasizing any one factor (pulse, etc.) at the expense of the others. It were very much to be desired, that in private practice much more attention were paid to the consideration of the child's condition than is usually the case. One thinks entirely of the mother, without so much as ever listening for the fœtal heart sounds. It is generally understood that the obstetrician only performs such operations on the living woman as he is thoroughly conversant with and whose signification, evil results and dangers he thoroughly comprehends; that he, in other words, recognizes from the indications present what is the right thing to do.

This is often by no means an easy matter to decide. How often do physicians hesitate between forceps and version, between cephalic and podalic version, or between forceps and cephalotripsy, and turning and cephalotripsy?

And yet only one of the two is always indicated; an "or" can never occur where there is an exact recognition of the situation.

If the necessity for interference is recognized, and it is decided what operation must be done, then it no longer depends on the pleasure of the physician as to when he will operate or how long he will delay, but the operation must be performed as soon as the requisite conditions for the operation, which are recognized as necessary, have been entirely or mainly fulfilled.

With the forceps one would wait until the head engages and the os uteri is sufficiently wide; even so a version will only be delayed until the os is satisfactorily dilated; a perforation will only be done if the head does not rest too high and the os is wide enough, etc.

CHAPTER III.

Preparations.

Preparation must be made for each operation, either by the physician himself or his assistants; this refers in the first place to—

The Position for Operating.—The oldest position for the parturient woman was on the ground, covered or uncovered. The women of Lacedæmonia laid themselves down on a shield. Very soon, however, we find them taking refuge on a true bed. Hippocrates called the bed, κλίνη, as a couch for delivery (1, 94). Pausanias founded at Epidaurus, about 480 A.D., the first maternity hospital (compare Siebold, 1, 62). A long time before the birth of Christ a labor chair was used, which has been retained even to the present day. See pages 181 and 182.

In Rome the parturient spread out precious coverings in a room set aside for the purpose, washed herself, encirled her head with a binder, loosened her sandals and laid herself down on this couch covered with the Pallium.

The position transversely across the bed in obstetric operations has already been described by Celsus in connection with version.

Later, the parturients seated themselves on the thighs of another woman, by whom they were held.

The knee-elbow position was also early recommended, especially for very fleshy people, by Ali Ben Abbas, 950, and Serapion, 800 A.D.

The general requirements for a definite position for the parturient during the performance of an operation are, first, that the table or bed upon which the woman lies be not too low, at least as high as the common bed, and, better still, the height of an ordinary table; that it be secure, not yielding or too easily broken; and that it can be easily reached from all sides, and that eventually, perhaps during the operation, it can be moved about. To protect it from getting wet and soiled, it will be well to cover it with some waterproof material. Besides the ordinary bed, which, in any event, can be raised by horse hair, straw or meadow-grass pillows, and can be made firm for the pelvic extremity of the parturient, I recommend the use of a strong table or a commode, not too short, especially in narrow rooms where the light is bad and in which the bed is hard to move.

Before the bed should stand a pail to collect the various fluids and excrement coming from the mother and child.

The position transversely across the bed is the one most frequently used during operations among obstetricians of the present day. The bed stands with one side against the wall; the pillows are laid just against the wall, close to the head of the bed, which must be free, so that any one can approach the edge; a firm pillow, not too high, is placed under the pelvic extremity of the woman on the free side, two chairs, facing each other, are placed before the bed, and between these a third; the former for the feet of the woman, the latter for the obsetrician. Two assistants are required: one who stands at the head of the bed, to support and hold the woman; the other to grasp securely one leg of the parturient at the knee, while the other foot rests free on the chair. In the absence of a third assistant, the instruments should be previously arranged so as to be within easy reach. If the midwife is the only skilled assistant present, she must be at the head of the bed, so that she can come forward at any moment and receive the child. At times the duty of chloroforming the patient may be intrusted to her during the operation.

The parturient must be dressed in a pair of drawers and stockings before the operation. The position transversely across the bed can easily be converted into the lithotomy position by elevating and pressing both thighs, bent at the knees, against the body of the parturient; this is especially to be recommended in operations at the inlet of the pelvis.

Advantages of the Position Transversely Across the Bed.—It is very easy to reach into the genitalia and to thoroughly examine them. One can without difficulty pass up with both hands on either side of the pelvis, and can most safely accomplish the loosening of the after-coming arms or head. The control of hemorrhage and the protection of the perineum are easy.

Objections.—One is cramped for room by the lower extremities; cannot so well or so conveniently grasp the fundus uteri; cannot acquaint himself so well or so quickly with the general condition of the parturient (pulse), as, for example, in the lateral position; and one must often lose a part of his strength by fixation of the instrument from behind (difficult forceps operation in first position). Two assistants at least are necessary, and even with these the woman cannot always be securely held; and the operator himself is pushed aside by the frequent kickings of an unruly or narcotized parturient.

These objections (leaving out of consideration the long preparations, the distressed feelings of the parturient and the anxiety of other persons present), outweigh the advantages. In most cases this position must be dispensed with; yet it always remains the best to use for retraction by the breech.

In the so-called half cross-bed the parturient is laid diagonally across the bed, so that one of her feet rests on a chair before the bed, the other is pressed against the footboard, and the obstetrician sits between the thighs. This position is only used in place of the cross-bed for lack of assistants, has otherwise no advantages, and, in comparison with the latter, has the same disadvantages.

The Ordinary Position on the Back Lengthwise in Bed.—The upper portion of the body lies moderately flat, and the pelvis is supported by a hard pillow. The two extremities are covered with separate sheets up to the genitals; the operator stands on the right side of the woman if the bed is placed against the wall; if it is entirely free, he can change his position during the operation. He requires only one assistant, who serves in holding the woman and at the same time holds one leg bent at the knee, while the obstetrician performs the operation over the other.

Advantages.—Moderate exposure and few assistants necessary.

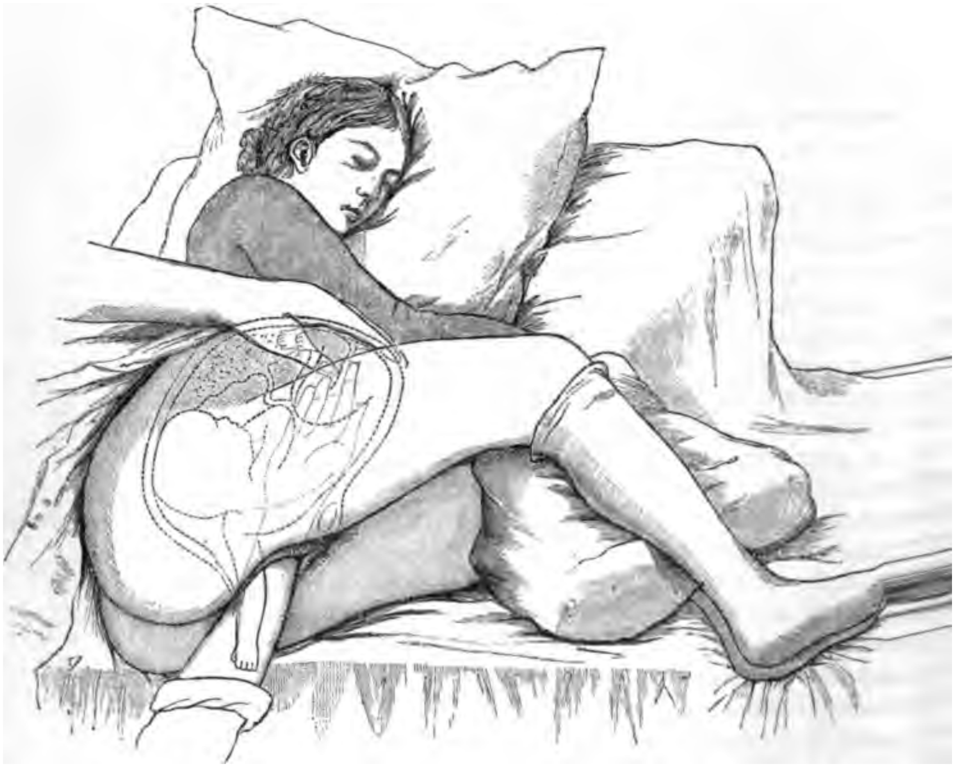
Disadvantages.—The pillows hamper the movements of the arms; the position hinders the introduction of the instruments from the side, where the obstetrician stands and operates; the anterior wall of the pelvis hinders the operations which are performed in the pelvic inlet. Hence the dorsal position lengthwise in bed is only suitable for the easier cases of forceps operation where the head is low down.

The Lateral Position of the Parturient.—The bed stands with one side against the wall; pillows are laid in the middle of it against the wall, a hard pillow is placed under the pelvis at the free edge of the bed. The knees are strongly drawn up, the legs being bent at a right angle to the thighs, so that the heels just come to the edge of the bed; between the knees adjust a small, thick, but not too hard pillow (Fig. 134). No assistants are needed.

Advantages.—The woman can very easily be held, the physician can himself anæsthetize the parturient during the operation, can obviate an impending asphyxia by drawing forward the tongue. He can further, while operating with one hand, lay the other upon the parts above the pelvis and press them down toward the rim of the pelvis. He can very easily acquaint himself with the condition of the woman by feeling the pulse in the intervals of the operation; he sees the genitalia clearly, can even look into them (which is impossible with the cross-bed posture), and can observe the descent of the head and can alter it if necessary. The bed itself remains dry, and the accoucheur uses all his strength, since he makes traction toward himself on a level. The woman, also, will be exposed scarcely at all, and with the greatest ease the side position can be changed into any other in the shortest time.

Disadvantages.—Operating with the hand in the upper half of the pelvis is somewhat more difficult for the beginner. It is not suitable for all cases, especially not for the rapid loosening of the after-coming arm. The after-coming head, however, can be easily delivered in this position. It has the greatest advantages in version, next in extraction of the head where there is a scarcity of assistants.

FIG. 134.



Transverse Position II, a. Patient in left lateral position. Right hand of operator is in the uterus and to the left side of the child. Left hand on the mother's abdomen, over the breech of the child.

The *knee-elbow position* can only be made use of in exceptional cases, thus in reposition of the retroverted pregnant uterus and sometimes in catheterization, if it cannot be successfully done in the dorsal or lateral position. The person to be operated upon kneels lengthwise on the ordinary bed, bending the upper portion of the body over forward, then the elbows are stretched out so far that the chest rests upon the bed and comes to lie much lower than the buttock, while one cheek rests upon the crossed forearms. The operator stands on the right or left side of the woman, according to the hand with which he will operate. There is no advantage in letting the knees of the woman rest on two chairs placed before the bed and the upper part of the body on the bed. The knee-elbow position has no advantages at all over the dorsal position or the cross-bed; in the lateral position one can reach into the deepest bulging of the anterior uterine wall just as well as in this position. On the other hand, one cannot use anæsthesia in this position, since the parturient falls in a heap; further, one cannot watch the fundus uteri so well, since it is pressed down by its own weight, and we are compelled to raise it with the whole hand, in order to fix it in the pelvic inlet, on which account Ritgen advises letting two assistants hold it with a towel during the operation. Further, it is in this particular position that the uterus can be easily torn away from the vault of the vagina, and, finally, that most dangerous of all accidents, entrance of air into the genitals, is especially encouraged. In short, the knee-elbow position has serious drawbacks and no special advantages; it has been almost entirely abandoned by most obstetricians. The obstetrician, moreover, should be able to operate on any couch. After the necessary one has been arranged, the obstetrician will, as further preparation, attend to the evacuation of the neighboring organs, the bladder and rectum. Emptying of the bowel at this stage is seldom necessary, since this has already been accomplished by an enema. The parturient passes the urine spontaneously, or, if this is not possible, the physician introduces an elastic catheter, for which purpose he uses one which is not too thin and has, of course, been carefully disinfected. The emptying of the bladder must be complete. Before the physician undertakes any obstetrical operation, he must not alone disinfect his hands, as already described on page 178, but take off his coat, roll up his shirt sleeves above the elbows and then wash the forearms as well as the hands in a sublimate solution (0.1 per cent.). If he has had anything to do with a post-mortem or with an infected puerperal woman, and, moreover, if he has had to make daily applications to puerperal ulcers, or a short time previously has removed sloughing placental tissue from the uterus, he must, first of all, undertake no obstetrical operations for some days, and only when he has removed every trace of odor from his hands and garments can he examine a parturient. I have strenuously enforced this quarantine, as the first edition of my work on "The Pathology of the Puerperium" shows, upon myself and my assistants since the year 1864, and also upon those midwives, whose patients have become sick.

CHAPTER IV.

Further Preparations. Anæsthesia of the Parturient.

Shall chloroform be used in all obstetrical operations? No; because induced abortion, the induction of premature labor, incisions of the cervix, even the reposition of the prolapsed cord with the half-hand and the loosening of the after-coming arms or head, are so slightly painful or last such a short time that anæsthesia is superfluous. On the contrary, it is very beneficial in all cases of the more difficult forceps operations, versions, extractions, decapitations; in these and other difficult operations we shall only refrain from it if the family and the parturient are opposed to its administration. This seldom occurs, and to me has happened only once. The manifold objections which have been raised against the use of chloroform are best avoided by carrying the anæsthesia only so far that the patient feels the pains again at the completion of the operation, and with the crying of the child she awakens. Since most of the operations last only 10–15 minutes, if they are properly undertaken and performed, the anæsthesia need not last long and one requires only a little chloroform. Besides, an exhausted parturient is frequently narcotized by a small quantity. We have in chloroform the most excellent means of alleviating the intense pain, and thus to furnish rest for the parturient and ourselves during the operation. It does not entirely arrest the contraction of the abdominal muscles, however; the uterine contractions become somewhat weaker during the second stage by its use, but the pelvic muscles are relaxed and we can the more easily force our way through the vulva and into the uterus. An influence, and a moderate one at that, is only produced upon the uterine contractions by very deep narcosis, and for this reason anæsthesia acts exceptionally well in neglected transverse positions. Where it is evident that the operation will be quite difficult and protracted, we may precede the chloroform inhalations by a hypodermatic injection of morphia hydrochlor. 0.01 with atropia sulph. 0.001, according to the recommendation of Fraenkel. Naturally, one dare not make use of anæsthesia if the general condition of the parturient presents any contra-indications. The obstetrician will, of course, refrain from its use in a case of anæmia by placenta prævia or other cause, or in case of a dying person, in order to protect himself from the accusation that he had killed the parturient with chloroform. He will further avoid its use in well-marked goitre, in myocarditis, in cases of dyspnœa and of extreme collapse of the parturient. On the contrary, it cannot be dispensed with in Cæsarean section, and Martin's advice (*Monatsschrift für Geburtskunde*, XVIII, 249) not to employ it is incomprehensible, when one considers his great liking for chloroform. The simplest form of administering it is with a mask. The operator must himself begin the anæsthesia if no skilled assistant is present. When the anæsthesia is begun, the midwife may be permitted to hold the cloth, and the physician himself pours fresh chloroform on it if the parturient, during the beginning of the operation, recovers consciousness too quickly. Unless it is urgently necessary, no restorative need be applied after the operation; the patient is allowed to awake quietly, but under no circumstances should she be left until she has regained complete consciousness.

In place of chloroform a mixture of chloroform, ether and alcohol (3 : 10 : 10—Billroth) can be used, or of chloroform (2) and ether (6).

Methyl chloride, which formerly was never really pure, and has only recently been furnished in a pure condition by the firm of Bayer, in Elberfeld, has this advantage, that it does not act so injuriously on the heart as chloroform. I have employed it much in pregnant and parturient women, but with unfavorable results.

CHAPTER V.

The Obstetrician's Armamentarium and the Most Necessary Medicaments in Deliveries Completed by Operative Interference.

The instruments which an obstetrician must carry with him are stethoscope, pelvimeter, tape measure, a silver and an elastic female catheter, a pair of forceps of Naegele, Busch, Martin, Breus or of the Prague school, two perforators (scissors and trephine), a fillet-carrier, double hooks, two fillets of broad, strong silk, Braun's blunt hook, one medium-sized, strong elastic male catheter, one hypodermatic syringe, one cranioclast, one bone forceps (Mesnard), one irrigator, one long, strong pair of scissors, silk, catgut, silkworm gut and needles. All these instruments must be made aseptic before use, which is best accomplished by boiling them in a three-per-cent. carbolic solution from one-fourth to one-half hour; it is to be strongly recommended that immediately after their use they be disinfected in a similar manner. The medicines required are mustard leaves, tinctura thebaïca, chloral hydrate in one-gram doses, solution of ergotin (2.5 : 15.0), 50 gm. ac. carbolicum liq. and 20 tablets of corrosive sublimate (½ gram in each with chloride of sodium), 25 gm. of creolin; further, 50 gm. of liq. ferri sesquichloridi and as much ether, and, finally, 150 gm. of chloroform. These are most conveniently carried in a leather bag.

Since a bag thus equipped is heavy, and several of the bulkiest instruments are but seldom needed, one can omit in city practice the hook, perforator and the bone forceps; the remainder are absolutely essential, and should be in the obstetrician's bag, especially for a journey into the country. Above all things, such an armamentarium is expensive, and costs altogether about thirty-eight dollars. The obstetrician cannot, like the surgeon, postpone an operation or recommend another, and even accoucheurs with a limited practice require the use of all these instruments in the course of time.

CHAPTER VI.

Commencement and Completion of the Operation. General Advice.

Immediately before each operation the operator should carefully wash the external genitals of the parturient with a three-per-cent. solution of carbolic acid, and should inject from one to two pints of the same fluid into the vagina, to prevent germs from being carried from these parts into the uterus. On occasions, viz.: where the child is dead, where the liquor amnii is very offensive, or has escaped some time previously, or where the uterus and vagina are very dry, it is to be recommended that such a solution be injected into the cavity of the uterus. Before commencing the operation, all the instruments and other materials to be used (fillets, bandages, etc.) must be immersed in a large vessel filled with a three-per-cent. carbolic solution; this is placed on a chair near the parturient, so that the articles can be easily reached, and after use can be at once replaced in the solution.

In conclusion, I shall only add that if an obstetrician has undertaken an operation on a parturient and cannot completé it, through some difficulty or other, he should secure the help of a brother practitioner, but in the meantime he must remain with the patient and not leave her helpless and without assistance, as I am sorry to say so often occurs. This shows a lack of feeling for the sufferer and great thoughtlessness on the part of the physician, and is, moreover, punishable, according to law.

If an obstetrician comes to a parturient on whom vain attempts at delivery have already been made, he must make it a rule, before he undertakes the operation, to ascertain all the facts enumerated in one of the previous chapters; also if any injuries to the mother or child are present, what they are and to what dangers the two lives are at the time exposed. This is not to cast any reflection upon his colleague, who could not finish the operation, for the lacerations that may exist; but only to protect himself from the imputation that he was the cause of them; this is indispensable and unobjectionable. Any lacerations of the perineum that are present, deep vaginal or uterine tears, fractures of the child's bones, and other injuries as well as hemorrhage, etc., should be noted.

If the accoucheur meets with an unexpected difficulty during any operation, he should not seek to overcome it by applying an increased amount of force, but he should examine anew to find if he has not erred in his diagnosis; he may change from time to time the direction of his traction, change his operating hand, improve the position of the parturient, give more chloroform, remove the instruments entirely to introduce the half or whole hand, to acquaint himself more exactly with the hindrance—in short, he should first examine and then act: it is not always brute force which conquers!

Immediately after the operation, the patient must be subjected to a new examination. The condition of the external genitals and the introitus vaginæ is to be most thoroughly ascertained; any lacerations to be felt on the cervix or vagina are to be examined with a Simon's speculum, and the source and quantity of any hemorrhage to be carefully noted.

At the conclusion of the operation, another irrigation of the vagina with a three-per-cent. carbolic solution is advisable in most cases, and after this is done, the woman, properly dried, is laid in a warm bed, with the thighs in apposition. Wherever any inflammatory process is to be feared, the ice bladder, as a prophylactic measure, is to be applied at once over the uterus.

After the more difficult obstetrical operations, the physician must remain a certain time at the bedside of the puerpera, and observe the loss of blood from the genitalia and her general condition. As much care is to be given to the child as to the mother; how children born asphyxiated are to be revived will be spoken of later. Examinations for fissures of the cranial bones, fractures of the extremities, lacerations of the soft parts are to be made, and, finally, a binder is to be applied. But how often is all this purposely ignored!

SECTION I.

Preparatory Operations—The Artificial Induction of Labor.

CHAPTER I.

The Induction of Abortion.

LITERATURE.

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Historical.—Among the ancients, both laymen and physicians knew that violent movements, dancing, jumping, lifting of heavy weights, rubbing of the abdomen in the bath, steam baths, venesection, as well as internal means, could expel the ovum, which had been conceived per negligentiam, as Aspasia expressed herself; and that these means were frequently employed by physicians and laymen is evident from that section of the Hippocratic oath which forbids the induction of abortion. When, later, the induction of abortion was generally held to be a crime, physicians advanced the idea that it might be used as a method of curing certain diseases of pregnancy. Thus Priscianus (350 B.C.) advised it in diseases of the uterus and in an immature parent in order to preserve her life (Siebold, I, 197); Avicenna recommended it for small persons, if there were danger of their dying as a result of labor. Although Tertullian, one of the Christian Fathers, acknowledged its admissibility, if the object were to save the life of a pregnant woman, yet this indication was later rejected as absolutely unjustifiable, and until the middle of the eighteenth century the induction of abortion was considered a crime by physicians. Then, in the year 1771, William Cooper introduced the operation anew into England. Hull, Bruns, Davis, and Blundenell followed him, and in France Dubois, Danyau, Chailly-Honoré, Velpeau. Germany was the last to resume it. Kilian in 1834 designated it as a crime; Hohl, in 1861, spoke of it as a step backward, although he granted the admissibility of the indication in absolute pelvic contraction, if the mother gave her consent. In more recent times, Pajot and Stoltz have warmly disputed about the latter indication for induced abortion; while the former rejected it, the latter preferred to see it everywhere used instead of the Cæsarean section, since this had never been successfully performed in the Hôtel Dieu.

In Germany this operation is restricted as far as possible, and this is best made clear from the fact that it was performed only once in the above-mentioned 100,000 hospital deliveries. It is held that the unborn child has also a right to live, while the disregard of the fœtal life among the ancients arose from the fact that they believed the embryo not to be possessed of a soul. That, on the whole, in England the child's life is not given due consideration is evident from the great number of perforations which are there performed in the hospitals, in comparison with forceps operations.

By induced abortion is understood the provocation of labor at a time when the embryo is not yet viable; that is to say, within the first seven lunar months. This definition includes the induction of immature labor. The indications which call for the operation are furnished altogether by the mother, since the child must be sacrificed, and are:—

Faulty conformation and diseases of the pelvis. Absolute contraction of the pelvis, that is to say, a conjugate under 5.5 cm., is a reason for its performance, according to the opinions of many French, German (*Hohl*, *Naegele*, *Braun*) and Russian authors (*Howitz*), if the mother does not consent to the Cæsarean section or if this operation would probably be unsuccessful. Of late this indication has been very materially restricted by the excellent results of the Cæsarean section. While the opinion of German authors still remains decidedly opposed to the induction of abortion in those cases where the person under consideration has been repeatedly delivered of dead children by the forceps or by perforation, it is, according to French authors, justifiable where at the end of the pregnancy cephalotripsy or perforation will almost certainly be required (*Cazeaux*). This last indication is much too elastic, because probability never allows of such definite prediction, and because living children have repeatedly been born, even through contracted pelves of the third degree.

Faulty conditions and diseases of the soft parts and their appendages were also held to furnish an indication; for example, tumors of these parts, such as fibroids, ovarian cysts, carcinomata, polypi of the body of the uterus and the cervix. In regard to cancer, we have already freely expressed our opinion on page 546, and accepted the indication; for the rest of the anomalies, however, we dispute it. Myomata are often removed during labor (*Danyau*), or spontaneously expelled or reposited; likewise ovarian tumors (*Hecker*). The rarity of this indication has been sufficiently discussed above.

Metrorrhagia in incipient abortion has also been advocated as an indication. If this becomes at all profuse, the abortion will certainly occur, and hence does not need to be induced. But if the hemorrhage is profuse enough to endanger life, the abortion is to be hastened by tamponing the vagina.

In irreducible hernia of the gravid uterus, the operation is also indicated whenever the embyro is dead and so small that the hernia can be reduced through the ring after the liquor amnii has been evacuated.

In retroversion and retroflexion of the gravid uterus, it is right to induce abortion, if conditions which jeopardize the life of the patient, such as diffuse peritonitis and the more threatening symptoms of incarceration, occur. But undue haste in accepting this indication should be guarded against.

Local and general diseases of the mother that are liable to prove fatal. To this category belong:—

Incarcerated inguinal hernia; this calls for herniotomy but never for the induction of abortion.

Well-marked albuminuria (nephritis of pregnancy) eclampsia gravidarum, furnishes, in my estimation, no indication. For, in the first place, we are not in a position to bring about the expulsion of the fœtus in a few hours, and further the local irritants used to induce the abortion increase the eclamptic attacks without the prospect of arresting them, surely or even probably, even when the embryo is completely expelled. Above all, we have in chloral hydrate, chloroform, and in the treatment with hot baths, a much safer means of controlling this disease than by inducing abortion.

Uncontrollable vomiting of pregnancy, which threatens the life of the mother, has repeatedly been regarded as an indication. Tyler Smith narrates two cases of this nature; but both women died, one of them undelivered.

For this indication Dance, Forget, Vigla, Ashwell, Davis, Johnson, Lobstein, Chailly, Rigaut, Breschet, Maygrier, Danyau operated successfully. Abortion has frequently occurred spontaneously in such cases, more often some measure was finally successful in checking the vomiting, most commonly the vomiting ceased spontaneously without any remedies, and the living child was carried to full term. I have observed only one case in which the gravid woman was reduced to a skeleton. She aborted spontaneously at the sixth month and afterward recovered. But there were some cases which other physicians thought presented the indication for inducing abortion, which I denied, and the patients happily recovered without the operation.

Decidedly inadmissible are the following diseases that have been claimed as indications, viz., general anasarca, the severe form of icterus gravidarum, and diffuse peritonitis.

In conclusion, there is one disease of the ovum that, in my opinion, is an indication for the induction of abortion, that is, extensive myxomatous degeneration of the chorion, if it increases rapidly and is associated with equally progressive anæmia of the mother. Under these circumstances I have once induced labor. (See "Pathologie des Wochenbetts," third edition, p. 148.)

Thus, of all the indications advocated, only five remain which appear to have any justification, and in accordance with which English, French and German obstetricians often act:—

(1) Absolute contraction of the pelvis, if the mother refuses to consent to a Cæsarean section, or her chances of recovery from this operation are doubtful.

(2) Retroversion of the gravid uterus, with symptoms of incarceration dangerous to life, if all other means prove fruitless.

(3) Under some circumstances also the uncontrollable vomiting of pregnancy where life is threatened.

(4) Diffuse myxoma of the chorion.

(5) Cancer of the uterus.

The disadvantages and dangers of the operation depend in part on the methods employed; otherwise they are the same as those of any abortion. That, because of the rupture of the membranes and the draining away of the liquor amnii, more delay and danger threaten the woman than in spontaneous abortion, where no rupture necessarily occurs, is self-evident.

Hayward found in a coroner's inquest, in the case of a woman who died from induced abortion, an opening the size of a goose quill in the right common iliac artery, from which the woman had bled to death. If the patient escapes with her life, an inclination to abort persists for some time. Harris narrates that he delivered a woman by induced abortion, and that she always aborted afterward. Life may be endangered by profuse hemorrhage after abortion. We are not yet in a position to induce it rapidly, and it still remains, for retroversion of the uterus with incarceration and for uncontrollable vomiting, an uncertain means of relief.

The Performance of the Operation.—Carl v. Braun correctly states that th method of inducing abortion is the same as that of inducing labor; however before the middle of pregnancy the uterus reacts slowly, if at all, to some o the irritants that are successfully employed during the later months, as th catheter, douches and tampons. We must choose the means according t the indication. Where a rapid expulsion of the fœtus is required, an irritan must be placed in the uterus itself; laminaria bougies are better than th catheter, because they open the way for the ovum by dilatation. Immediately afterward we introduce a colpeurynter, and, with Howitz, I am i favor of a combined method: first of all dilatation and preparation of th cervix by the colpeurynter or laminaria tents, then separation of the membrane about the internal os with a sound, and finally, if pains set in, rupture of th membranes after the third or fourth month, but not earlier.

In retroversion with symptoms of incarceration, where the os externum i not within reach, the slowly-acting colpeurysis cannot be of use. If the o can be felt, it may be drawn down with a tenaculum, and, according to P. Müller, a bougie can be introduced through it.

There remains, besides, aspiration of the uterus through the posterior vault of the vagina and the withdrawal of a portion of the liquor amnii. Hunter advised aspiration of the uterus in incarcerated retroversion of the uterus. Jouel, of Rouen, practiced it first in 1811, after him Viricel, in 1813. The former aspirated through the posterior wall of the vagina with a trocar used for hydrocele; Viricel, however, aspirated through the rectum. Desormeaux and Dubois preferred aspiration through the vagina.

In Viricel's case, after the removal of half a pint of clear amniotic fluid, alleviation of the symptoms and diminution in the size of the abdomen resulted, and on the fifth day, in the morning, strong pains set in, which in two to three hours caused the expulsion of a four to five months' dead fœtus. The uterus then returned to its normal position, and the patient left the institution in one month, cured.

Aspiration of the uterus of course can only be applied to those cases where the cervix is not accessible to the finger or instruments. A slightly-bent trocar, resting upon two fingers of the left hand, is introduced with the right and forced through with the stilette only when its point has reached the deepest part of the body of the uterus. After removing the stilette the liquor amnii is allowed to flow away until the uterus is markedly diminished in size, and the canula can be kept free by means of an elastic catheter, which may also replace it for a short time in case of need. If, however, the cervix is accessible, as, for example, in cases of chronic, uncontrollable and dangerous vomiting of pregnancy, laminaria tents are introduced into the uterus (a description of this operation follows in the chapter on the induction of premature labor). The treatment of the abortion about to occur is in every respect the same as that of any other. One rule, which should never be neglected before the induction of abortion, is this: To secure the advice of one or more colleagues beforehand, not because of the difficulty of the operation, but in order to make no secret of the matter, whereby the obstetrician may be saved from any reproaches in the future.

If the indications for inducing abortion are very rare, and if the only rational ground is and remains a firm conviction that the mother would surely be sacrificed without it, this is sufficient to secure to this operation its suitable place, for I say, with Gérard: "Je pense donc qu'il est permis au médecin, qu'il est même de son devoir de sauver l'un des deux êtres aux depens de l'autre."

CHAPTER II.

The Induction of Premature Labor.

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By "the induction of premature labor" we understand the provocation of labor at a time when the child is viable and can be kept alive. The chief object of this procedure is to save the child's and the mother's life, if either of them would be endangered were the birth to occur at full term.

History.—The operation dates from the middle of the last century. Thomas Denman, Obstetrician to the Middlesex Hospital, London, relates that in 1756, in that city, an assembly of obstetricians was convened to decide if the induction of premature labor could be sanctioned on moral as well as practical grounds, and the decision was favorable to the operation. Macaulay was the first to perform the operation and Kelly followed him, operating three times on one woman and saving two of the children; shortly after Denman himself did it, and up to the year 1801 operated 12 times. In France Petit (?) is said to have advised the induction of premature labor, in faulty pelves, and to have himself performed it; Roussel de Vauzesme, 1778, in his treatise on Symphysiotomy, said that labor could be induced in the 7th or 8th month. Baudelocque alone opposed it, in his text-book, 1781, and for this reason it did not come into favor in France. In Germany, on the contrary, Franz Anton Mai, of Heidelberg, 1799, advised, without the knowledge of the action of the English, the induction of labor in contracted pelves by rupture of the membranes, after due preparation, and his pupil, Wenzel, did the operation successfully in 1804, then in 1808, and once again in 1817. Krause performed it at Mayence in 1813, and, besides him Froriep and Reisinger, who had both become acquainted with it in England, recommended it. Elias von Siebold was the first to perform it in Berlin, 1819, and, finally, Stoltz (1831), of Strasbourg, succeeded in securing admission of the operation into France. He brought his case to a successful issue, laid the matter before the Paris Academy, and won a firm supporter in Dubois, 1834, who chose this for the subject-matter of a thesis. The men who are deserving of the greatest credit for the perfection of the operation are: D'Outrepont, Kluge, Ritgen, Mende, Hueter, Kiwisch, C. v. Braun, Wilson, Barnes and Tarnier. In the year 1870 Spiegelberg justly restricted the indications for this operation still more, by clearly establishing the dangers of the procedure for the child, on the strength of extensive observations.

Dohrn, Scanzoni and Litzmann have likewise contributed to its proper appreciation.

The *indications for inducing premature labor* may be divided into *three groups*, each of which presupposes a definite series of conditions.

1. *In contracted pelves.* The object of the operation is the saving of the life of the mother, and especially that of the child, even if the former could be saved at the end of pregnancy, while the latter would certainly have to be sacrificed. An exact limitation of this group of indications in centimetres for any individual case is to be objected to.

The conditions for these indications are: The fœtus must be living and viable. The form and degree of the pelvic contraction must be accurately investigated and established. The duration of pregnancy must be carefully computed. Then an indication is to be found (*a*) in the general symmetrical contraction of the pelvis, even if the shortening of the several pelvic diameters amounts to but 1½ cm., because the circumference of every aperture is very much diminished in such a case. Litzmann considers a conjugate lessened to 90 mm. to be an indication. Under such circumstances we are justified in performing the operation even on a primipara. (*b*) In contracted pelves of the second and third degree (82–79 mm.) of multiparæ, if the previous children were all stillborn. By themselves these contractions of the pelvis give no absolute indication, since living children have repeatedly been born in such cases at the end of pregnancy; this applies also to osteomalacic pelves. (*c*) In contracted pelves of the first degree (8 cm. and above) we are only justified in operating—in spite of the opposition of many authors—if the previous children have died during or as a result of the labor, because they were especially well developed.

The time for inducing labor in the case of these three indications depends upon the form and grade of the pelvic contraction: the greater this is the earlier, but in general not before the 30th week. The experience on which this method of treatment is based is the fact that the child's head between the 30th and 36th weeks is much smaller, softer and more yielding than in the last weeks of pregnancy. Its greatest transverse diameter grows from the 30th to the 33d week from 5.5 to 6.0, and from then on to the 36th week from 6 to 7 cm. The transverse diameter of the child's head grows from the 30th to the 40th week scarcely more than 1 cm.; therefore, where the conjugate measures 8 cm. or more, we could choose the 35th week for the induction of labor; where it measures 7.5–8 cm., the 31st to the 34th week; and for smaller measurements, the 30th week. Moreover, the whole history in connection with all the measurements (circumference of abdomen, height of umbilicus and fundus uteri, direct measurement of the head felt through uterine wall) will enable us only to make an approximate estimation as to the size and resistance of the child's head.

2. *In diseases jeopardizing the life of the mother*, whether they are directly associated with pregnancy or not.

The conditions for this indication are that the mother should be able to bear the operation, that is to say, not be moribund; further, that the child be living and viable.

(*a*) In eclampsia gravidarum the operation is unjustifiable in my estimation. Cazeaux has expressed the same opinion. The attacks are increased and made more severe, and labor cannot be induced for hours. The treatment with hot baths, morphine and chloral hydrate is better and safer.

(*b*) In ascites, anasarca and dyspnœa, with heart and lung diseases and nephritis, the operation has been proposed. If these affections have attained an extreme degree, the operation is sometimes justifiable. Here the same rules apply as in (*a*).

(*c*) In placenta prævia lateralis and centralis, if profuse and continuous hemorrhages endanger the life of the mother. Puzos, in 1759, first stated that labor could be induced in placenta prævia by rupturing the membranes, and the mother and child be saved.

(*d*) In acute diseases, such as cholera, pneumonia, typhoid fever, dysentery, pericarditis, variola, the indication does not suffice, because in most cases the child is also diseased and cannot be saved; frequently it remains sound and is carried to full term; sometimes premature labor occurs spontaneously at the crisis of the disease and is often very rapidly completed. If the death of the mother were certainly to be expected before the normal end of her pregnancy, the induction of labor might be indicated, if the child were living and viable; but who could establish the former diagnosis so surely and at the same time guarantee that the woman will live through the premature labor?

3. *In diseases of the fœtus*, where it habitually dies at a time when it is already viable, and in hydramnios which increases in bulk very rapidly.

Conditions for the former are the still-births of several children at the same period of pregnancy. The causes for this condition may rest in part on the fœtus (pressure on the cord) and in part on the parents (syphilis). Both influences frequently manifest themselves at the same period of pregnancy. Although hereditary syphilis *per se* gives a very bad prognosis, since the child, if born alive, will probably die in the first year of its life, yet the attempt should nevertheless be made, as such children are repeatedly kept alive by the use of mercury. The earlier objections—that the time for the operation cannot be accurately determined, the effect of other means (rest, diet, etc.), upon the pregnancy, that the cause of the premature labor lies in the organism of the woman and that the operation is, therefore, especially dangerous, and that every pregnancy does not always end in the same manner—are not valid.

In hydramnios which increases rapidly and incoveniences the mother, causing dyspnœa, anxiety and oppression, the indication lies partly in the condition of the mother, but partly also in that of the child; since the nutrition of the latter can no longer remain normal, it must starve, while we hope to better its nourishment outside of the uterus by means of a good wet-nurse, unless it is already dropsical.

The presence of a dead fœtus in the uterus alongside of a living one does not warrant the induction of premature labor, since the latter is frequently carried to full term.

Prognosis.—The prognosis, aside from the performance and mode of operation, differs according to the indication, and is of course more unfavorable in the various diseases of mother and child than in cases of contracted pelves, and among the latter is again better in the simple, symmetrically contracted pelves than in those of the second and third degrees or in osteomalacia. The prognosis for the child, however, is better the older it is and the less interference is needed during labor. Infection of the gravida has occurred with all the methods; we can say of none of them that they are absolutely free from danger. Of late the general rigorous practice of antisepsis during labor has, however, greatly improved the prognosis for the mother, although it is not yet so favorable as when labor commences spontaneously.

Of the children born at 7–8½ months, only 33 per cent. are actually kept alive.

The preparation for all the methods of operation enumerated below consists in securing copious evacuation of the bowels, in repeated warm baths and in the antiseptic irrigation of the genitals given several times daily. An airy, quiet, easily-ventilated room must also be chosen, and all preparations must be made for labor, even for its artificial termination. But in this connection we must not forget that all operative interference in induced premature labor results almost always very unfavorably for the child, so that it is only to be considered as a last resort.

The use of internal medicines alone, especially of ergot, is said, according to Churchill, to have been successfully employed by Ramsbotham in 26 cases. All the mothers did well and twelve children were born alive. In more recent times this method has become almost obsolete on account of its uncertainty, as has also the starvation method recommended by Merriman for the same purpose.

METHODS OF OPERATION.

I. *Puncture of the Membranes.*
  After Denman, Scheel, 1756, 1799.
  After Hopkins-Meissner, 1814–1840.

II. *Separation of the Membranes from the Uterine Wall.*

Without allowing the instrument to remain.	Index finger: Hamilton, 1836. Catheter: Riecke, 1827.

Leaving the irritant behind.	Uterine injections: Cohen, 1846; Schweighäuser, 1825.
	Catheterization of the uterus: Simpson, 1855; Krause, 1855.

III. *Dilatation of the Internal Genitals.*

Of the vagina.	Tampons: Schoeller, 1842.
	Animal bladder: Hueter, 1843.
	Colpeurysis: C. Braun, 1851.
Of the cervix.	Sponge tents: 1819–20, El. v. Siebold, Brünninghausen, Kluge.
	Metallic dilators: Busch, 1830; Krause, 1855.
	By conical laminaria tents: Wilson, Braun, 1863.
	By caoutchouc bags: Tarnier, Barnes, and others.

IV. *Thermic, Chemical and Electrical Irritation.*

Direct.	Uterine douche: Kiwisch, 1848.
	Electricity: Hoenig, Baer, 1861.
	Carbonic acid douche: Scanzoni, 1855.
Indirect.	Irritation of the nipples: Scanzoni, 1853.

In all 19 different methods have been employed, and of these 17 are confined to external measures.

Description and Criticism of the Several Methods for the Induction of Premature Labor.

I. The Evacuation of the Liquor Amnii.

Puncture of the membranes* was first used by Macaulay in England, 1756; by Scheel in Denmark, 1799; and by Wenzel in Germany, 1804. In a case of placenta prævia, Mme. Siegemund had already employed it about the middle of the seventeenth century.

Instruments.—Sounds (*Scheel*), aspirator (*Ritgen*), trocar needle (*Wenzel*, *Siebold*), hair-pin (*Siegemund*), elastic catheter (*Lee*).

Operation.—1. The puncture was made directly *within the internal os*, according to the English and Scheel. The instrument, guided by two fingers of the left hand, was brought to the external os, and being passed through it and the internal os, the membranes were punctured; according to Lee, a catheter was left in to allow of a freer discharge of the waters.

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* Rupture of the membranes, its indications and performance during labor, have already been discussed on page 344.

2. The puncture of the membranes was made *high up, above the internal os*, as *high* as possible in the uterus, according to Hopkins, 1814, and Meissner, 1840. This was done by specially constructed instruments in the form of sounds or trocars, which (*Meissner*) were bent to correspond to the curve of the pelvis. C. v. Braun perforated the membranes above the internal os with a goose quill, cut in the form of a toothpick, and through which a sound had been passed, the point of the quill being pushed forward.

The disadvantages of both of these operations lies in the diminution in size of the uterine cavity and the dangerous increase of pressure on the child resulting therefrom. The time at which pains occur after the puncture of the membranes varies from three hours to fifteen days. Of 182 children delivered by the method of Scheel, 69, more than one-third, were stillborn. In 11 cases of Ritgen, where the liquor amnii was only partially removed, it was effectual in 10 and two children were stillborn. In Meissner's method, who pushed a long curved canula between the uterus and membranes, then perforated the latter with a stilette, and withdrew the canula after allowing 15 gm. of fluid to escape, a bag of waters at labor was by no means always formed, even if the operation succeeded; the membranes rather were closely applied to the head, and the liquor amnii flowed out of the opening during the pains. The second and weightiest objection to the puncture of the membranes is the loss of the bag of waters, which is followed by a slow, painful dilatation of the cervix and a greater compression of the presenting fœtal parts.

For these reasons puncture of the membranes is only employed if the life of the mother is more endangered by allowing the bag to remain intact, while the child can probably be saved. Yet in that event it is not employed alone, but other methods are employed at the same time, especially in placenta prævia lateralis and hydramnios. Since, as a rule, the effect of the puncture is rather rapidly produced, in from one to two days; since this procedure causes the minimum of danger for the mother; since the escape of water is not complete if the gravida remains at rest, and since some authors, like C. v. Braun, have secured quite favorable results for the children by this method, it is certainly worth more consideration than might appear from the preceding remarks.

It is, of course, unnecessary to employ anæsthesia in either method, and it can be performed in the ordinary dorsal position just as well as in the cross-bed or in the side positions. The patient is to be informed of the object, lest she be alarmed at the escape of the waters, and think that it was due to carelessness on the part of the physician.

II. Separation of the Membranes from the Inner Wall of the Uterus.

3. *By the Finger.* Hamilton recommended that the extremity of the membranes be loosened with the index finger for from three to four inches around the cervix. This operation is only possible in multiparæ, whose internal os is already patulous, or where the cervix is artificially dilated.

4. Riecke recommended for this purpose the use of a *horn catheter.* With it the membranes could easily be lacerated, and the method is uncertain.

5. *By fluids,* which are introduced between the membranes: *intrauterine injections,* first proposed by Schweighäuser, 1825, and first methodically employed by Cohen, of Hamburg, 1846. He made use of a flexible tube and a smaller conical tin tube with a bullet shaped end, the whole attached to a clyster-pump. He introduced the smaller tube by means of a staff as high as possible between the membranes and uterine wall, and then injected from 50 to 150 gm. He ceased when a distention of the abdomen was apparent, or when the injected fluid flowed back again. This was repeated in ½ to 2 hours. Tar water (*Cohen*) was recommended for the injection fluid, or warm water (*Naegele, Riedel, Harting*); better still is a 3 per cent. sol. of boracic acid, or a ½ to 1 per cent. solution of creolin.

Care is necessary in the introduction of the tube not to come in contact with the placenta, which accident is made apparent by a commencing hemorrhage; also not to puncture the membranes.

This method establishes the pains more quickly than any other. In my inaugural dissertation, I have reported several cases of my father's, in two of which the pains began 10 to 12 hours after the first injection. A. Krause has also emphasized the fact, that this method always causes contractions, and more rapidly than the others. The objections to it are, first, that injuries of the membranes are difficult to avoid. Then very intense reaction is often seen to follow this injection into the uterus: rigor, great anxiety, a sense of oppression, fainting. Martin reports a case of septic endometritis with sloughing of the thrombi in the uterine veins, in which an unavoidable hemorrhage occurred during the injection into the uterus, and the septic endometritis could be attributed to the entrance of water and air together. The separation of the placenta, at least in part, is unavoidable, where the injections are continuous. For these reasons the method of Cohen has been completely abandoned.

No preparations are necessary for the operation; it is advisable to introduce, the day before, a disinfected laminaria tent through the external os, so as to avoid as far as possible any laceration of the membranes; the internal os will thereby be opened, and the tube can be more safely introduced. If Cohen's instrument is not at hand, a metal or elastic male catheter suffices for the injection of the fluid. The operation is most conveniently performed in the cross-bed position, and the woman must lie perfectly quiet after it.

This method might still be employed, now that the dangers of septic infection can be more certainly avoided, when danger to the life of the mother calls for the most rapid establishment of pains possible.

6. By the *introduction of a bougie or catheter;* the so-called *catheterization of the uterus*. Before 1848, Merrem had already separated the membranes by introducing an elastic catheter in order to induce labor. Lehmann, 1848, advocated the use of an ordinary wax bougie and its withdrawal after satisfactorily loosening the membranes. Simpson and Krause, 1855, advised leaving the elastic catheter between the membranes and the uterine wall. C. v. Braun recommended a catgut bougie.

The patient being on the side, or in the cross-bed posture, the catheter, or better, a solid bougie, resting upon two fingers of the left hand, is passed through the cervix as high as possible into the uterus, so that the end of the instrument lies at the fundus. It must be at once withdrawn if there are any signs of bleeding; otherwise it may remain until the pains begin, and if these do not occur within 12–24 hours, then a second catheter is to be introduced near the first.

The objections to this method may be: laceration of the membranes, and a tardy establishment of the pains in from 12 to 52 hours. More serious, however, is the possibility of carrying along with the instrument infectious materials from the vagina or cervical canal into the body of the uterus. The separation of the placenta may produce endometritis by the formation of blood clots, resulting from the tearing of the smaller vessels; the same condition may result from the irritation of the catheter which has been left behind. Fatal cases of infection have resulted from this method. I have had a succession of cases of this kind that were favorable for mother and child, and as I have never been able to attribute a single case of disease to it, I am convinced that all the evil results can be avoided. Where the cervical canal is narrow, the preparatory use of laminaria or tupelo tents is to be advised.

III. The Induction of Premature Labor by Dilatation of the Internal Genitals.

(A) *Dilatation of the Vagina.*

7. *Tamponing of the vagina*, practiced by Schöller in 1842, with pledgets of charpie or cotton. In 1843, C. Chr. Hueter, in place of these, used an expanded animal bladder, which had been placed in the vagina. In 1851, C. von Braun, in place of the latter, employed the colpeurynter, made at first of vulcanized rubber and afterward of pure caoutchouc.

We have already spoken of the use of tampons of cotton in placenta prævia, on page 325.

A Sims speculum is introduced into the vagina, the anterior wall of which is held back with a depressor, and the tampons can then be rapidly introduced until the vagina is sufficiently expanded by them. Sublimate or creolin cotton is best for this purpose.

All of these methods have the disadvantage of being uncertain; tamponing with cotton caused no contractions at all in 5 out of 27 cases, and colpeurysis likewise failed in 3 cases.* The commencement of contractions varied from 1 to 17 (!) days. Besides, these methods cause troublesome vesical and rectal tenesmus, and sometimes an inflammation of the vagina results (*Kilian, Betschler, Krause*); furthermore the dilatation of the vagina is painful. It has even happened to one of my assistants, where colpeurysis was undertaken for some other indication, that, by overfilling the colpeurynter, a laceration of the vagina was produced, which I was obliged to sew up, because of severe arterial bleeding. For this reason tamponing of the vagina for the purpose of inducing labor has been abandoned, and is employed only for hemorrhages from the genitals during pregnancy, especially in placenta prævia.

(B) *Dilatation of the Cervix Uteri.*

8. *Dilatation of the Cervix with Instruments* (1830). Busch, Mende and Krause have each devised dilators of their own, the first a three-armed instrument; Mende a three-armed one which screws together and resembles a male catheter; Krause a slender pair of forceps. All three operate unevenly, are unsafe, are not harmless, and most decidedly objectionable in comparison with other methods.

9. *Use of Sponge Tents.* Brünninghausen first proposed this method in 1820; El. von Siebold performed it first in 1822; Kluge (Berlin) especially extended it. At that time pieces of the spongia cerata were used, 6–8 cm. long and 5 cm. thick, which, with a string attached, were introduced by means of a polypus forceps as far as possible into the cervical canal. Mende recommended instead of the spongia cerata the ordinary bath sponge, first dipped in a strong solution of gum, and then firmly wrapped with cord. At the present day prepared conical sponge tents, of any desired length or thickness, made after Marion Sims' method, can be obtained in any drug store or of any instrument maker. Instead of the polypus forceps we can use the index finger alone or together with the middle finger in multiparæ, or a pair of small forceps. They are most easily introduced in the side position. A Simon's speculum for the posterior vaginal wall is introduced, so that the portio vaginalis rests on its upper end; the anterior lip of this is fixed by a tenaculum and then the well-oiled sponge tent, lightly grasped by dressing forceps, is advanced into the cervical canal until its lower end just lies between the lips of the cervix. A cotton tampon is then placed beneath the tent in the vault of the vagina. The cervix may be previously rendered more yielding by the application of a hot douche; but this is not always necessary.

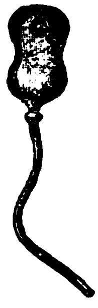
Advantages of this Method.—It corresponds more nearly with nature, in that a gradual dilatation of the cervix is effected without injury to the membranes; it is also safer for the child; of 176 cases, 133 children were born alive.

Objections.—It is uncertain. In the first place, there were no pains at all in 11 cases, and when they were established they were inefficient for 8 days, and the labor itself lasted much longer. The os is frequently difficult of access, or the tent slips out easily. The latter quickly becomes foul, even if it is carbolized, and must be changed at least once in 24 hours. Its rough surface may cause a severe irritation of the cervical canal, and may infect the inner surface of the uterus.

10. *Dilatation by laminaria tents or bougies,* made from gentian or tupelo (Nyssa aquatica). These were first introduced by Wilson, 1865, into surgical and gynecological practice, and C. v. Braun has used them extensively in the induction of labor. Their mode of introduction is the same as that of sponge tents, with or without preparation, and with or without the instrument of G. Braun, which resembles a curved needle-holder with the end hollowed out for the reception of the tent. This is generally superfluous. The advantages and drawbacks of this method are the same as those of sponge tents. They are less absorbent, however, and less dilatable, and are, therefore, not so efficient, but yet their surface is smoother and less irritating to the uterus. This method is especially good where the cervix is narrow; and if it does not act entirely alone it is decidedly the best method of preparing the way for the employment of any of the others.

11. *By dilatation of the cervix by means of a small caoutchouc or rubber bag* (methods of *Schnakenberg*, *Barnes* [1852], *Tarnier* and *Desgranges* [1863]). Barnes used an hour-glass-shaped rubber bag about the size of an egg, to which was attached a slender tube with stop-cock; this was introduced into the cervical canal with the usual precautions, and then distended with air or filled with water. The upper thick end rested in the internal os, the small part was grasped by the cervix and the lower broad end was at the external os (see Fig. 135). The pocket on the anterior surface of the bag is intended for the tip of a sound.

FIG. 135.



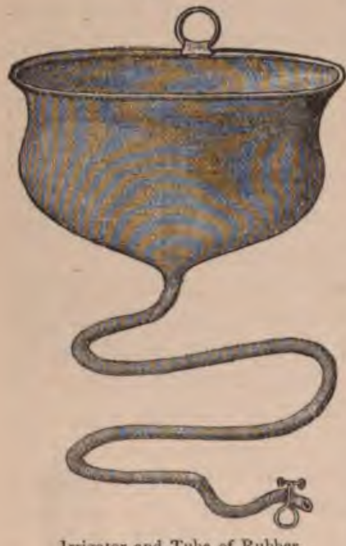
Barnes' Cervical Dilator.

Tarnier employed a sound, to the end of which was attached a rubber tube, which was passed above the internal os into the uterus and then distended with water. The advantages of this method are an easy, rapid, even and gentle expansion; the objections to this mode of dilatation consist in this, that the bag slips out easily at the onset of the pains or on the dilatation of the cervix, and the pains then cease. To prevent this, tampons of cotton must be placed in the vagina, and as soon as the cervix has become moderately dilated, the bag distended further, so as to increase the dilatation. Yet this may cause it to burst.

IV. Thermal, Chemical and Electrical Irritation of the Uterus.

12. *The uterine douche.* This was recommended by Kiwisch, 1848, for the induction of premature labor. He used a tin can, holding three litres, which was suspended three metres from the floor, and to which was attached a movable tube with stop-cock and a vaginal nozzle. The vessel was filled with water at 100°–104° F., and before opening the cock the physician passed the nozzle up to the cervix, so that the full stream of water, forcing its way through the opened stop-cock, might be driven against the lower part of the uterus. More recent experience shows that injections of hot water up to 122° F. can be made, and thereby the pains are more quickly and more certainly established. A funnel may be used for the injection just as well as a rubber irrigator, which latter the physician, however, should have in his instrument bag, and should carefully disinfect before using (see Fig. 136). This method of Kiwisch has not proved successful, for in 13 out of 68 cases it was ineffective; many of the mothers died, and of 50 children 29 (!) were stillborn. Strange to say, many unfavorable positions occurred among them. This method to-day is, on the one hand, employed as a preparatory measure, and on the other, it is especially useful in cases of rigidity of the cervix. It serves further to increase the pains that have set in, and injections of 2 litres of hot water (115–122° F.), repeated every hour, are employed with good results.

FIG. 136.



Irrigator and Tube of Rubber.

13. *The use of electricity,* either directly applied by placing the poles of an interrupted current against the lateral walls of the uterus, or by placing one against the cervix and the other over the uterus, was first proposed by Herder, 1853, and practiced by Radford, Kilian, Simpson and others. The results were doubtful in some cases. The use of the indued current was first proposed by Hennig, 1856, and later by Frankenhäuser, 1863. These authors sought to irritate the uterine nerves, whose fibres extend toward the rectum, and the uterine plexus, by introducing an electrode into the rectum. Hennig used for this purpose an olive-tipped wire, which was covered with rubber up to the bulb. Of late, the constant stream has justly been recommended, especially by Bayer (Strassburg). The anode is placed over the sacrum or the fundus uteri, and the cathode in the vault of the vagina or on the cervix; this certainly produces contractions, but

they seldom persist, act slowly, and are uncertain, for which reason this method has thus far secured few supporters (compare Grünewaldt: *Archiv f. Gynäk.*, VIII, 478. Bayer: *Zeitschr. f. Geburtsh. u. Gynäk.*, XI, 89. Bumm: *Archiv f. Gynäk.* XXIV, 38).

Entirely obsolete are:—

14. *The carbonic acid douche*, which was first employed by Scanzoni, 1856. Into a Woulf's bottle, bearing a cork with two openings, two tablespoonfuls of bicarbonate of soda were placed; through one of the openings passed a glass tube, to which was attached a rubber tube with a uterine nozzle; through the other, a glass tube with an upper funnel-shaped dilatation passed down to the sodium. After the nozzle had been introduced in the vagina, acetic acid was poured through the funnel on the sodium. The too rapid escape of the carbonic acid could be prevented by means of a stopper which was fixed to the escape pipe and fitted into the mouth of a vaginal speculum. This method is uncertain and, at the same time, dangerous, since alarming symptoms of intoxication may arise. One fatal case of poisoning has resulted from its use (Scanzoni's "Beiträge," III, 181).

15. *Irritation of the breasts and nipples* was first employed by Scanzoni, in 1853, with success. Long ago it had been proposed (by Friedreich, in 1839), but had never been attempted. Rubber suction flasks were applied to the nipples daily, for several hours at a time. This method was practically known among the common people; and the case narrated by Klob, where a lover set up a mastitis in attempting to cause the expulsion of a fœtus by steadily sucking at the breasts, is a classical proof of how well the laity understand the close connection between the breasts and the uterus. It is not applicable, however, to the induction of premature labor.

From the above citation of 15 methods that have been described, only 1, 2, 5 (very seldom); 6, 9, 10, 11 and 12 are to be employed, either separately or in combination. All of these methods can be performed in the customary position on the back, more surely and easily in the cross-bed posture, or in the side position of the woman. Anæsthesia is entirely superfluous for it, and any preparation, with the exception of previously emptying the bladder and rectum, is unnecessary; it might be advisable to give a vaginal douche, where the membranes are to be punctured. If pains have been established by any of these methods, the labor is to be managed like an ordinary one; but we must be patient, lest we operate too early.

SECTION II.

Operations for Overcoming Obstacles to Labor.

CHAPTER I.

Incision of the Introitus Vaginæ. Episiotomy.

LITERATURE.

Cohen: *Monatsschrift für Geburtskunde*, XVIII, Supplem., p. 106. Eichelberg: *Rheinische Monatsschrift*, 1850, p. 308. Manton, W. P.: "A Plea for Episiotomy." *Am. Jour. Obst.*, N. Y., 1885, XVIII, 225. Michaelis: *Siebold's Lucina*, VI, 23. Morris, W. A.: "Incision of the Sphincter Vaginæ in Certain Cases." *Daniel's Texas M. J.*, Austin, 1885, I, 4–9. Ritgen: *Neue Zeitschrift f. Geburtskunde*, III, 65. Scanzoni: "Lehrbuch," 1852, Bd. III, p. 15. Schultze, B. S.: *Monatsschrift für Geburtskunde*, XII, 241. Wilcox: "The Operation for Episiotomy." *N. Y. Med. Journal*, 1885, XLII, 176–180.

An incision into the external genitals to prevent an impending laceration of the perineum was first performed by G. Ph. Michaelis, in 1799, at Hamburg. He made, with a bistoury, an incision of about one inch into the raphe of the perineum on a parturient whose vulva was very narrow and unyielding; the labor was then easily completed. In the year 1836, Ritgen recommended scarification of the ostium of the vagina and the narrowest parts of it with a blunt-pointed bistoury; the incisions were to be ½ inch long and made between the pains.

Eichelberg in 1850, who considered the method of Michaelis objectionable, proposed an incision of 4–5‴ deep, made from the side of the posterior commissure toward the tuber ischii; Scanzoni, in 1852, proposed that two incisions should be made in like manner, with a blunt-pointed bistoury. In this manner B. Schultze performs it, only he uses an ordinary Lister herniotomy knife. Cohen has added to these four methods for episiotomy still another, his subcutaneous tenotomy of the constrictor cunni. His objection to the earlier ones was, that they did not restore the integrity of the parts and that the introitus vaginæ remained relaxed; in place of it he suggested the performance of the following operation just before the head is born and during the pains. With the left hand pressed down under the clitoris transversely at the middle of the labium minus elevate a fold of tissue lengthwise, with the right pass a small tenotome (with a cutting surface of ½–⅓″) under the clitoris from without inward over the constrictor cunni just underneath the mucous membrane, then turn the edge of the knife down and during a pain sever the strongly-stretched muscle to a depth of three lines, draw the tenotome out on its flat surface and then place a small piece of adhesive plaster over the wound.

The threatened destruction of the perineum is the only indication for episiotomy; this danger may be due to extreme narrowness of the external genitals, or to excessive rigidity of the soft parts, or to a faulty presentation of the child. It is done to prevent extensive solution of continuity, especially central rupture. The performance of the operation is easy and simple. It can be done equally well in the back or side position of the parturient, and is but slightly painful. The use of a herniotomy knife is not essential; an ordinary straight blunt-pointed pair of scissors, or, occasionally, straight, sharp navel-string scissors answer the same purpose.

Most obstetricians make use of one or more incisions, 1 to 1.5 cm. deep, directed obliquely toward the posterior commissure. Like B. Schultze I make them only during the pains, and only when I see the epidermis at the frænulum or at the middle of the perineum beginning to tear. Schultze was entirely correct in saying that there is really no indication for the operation sooner than this. We obtain by an incision of 1 cm. fully double that amount in the circumference of the vulva. Deeper lacerations of the perineum are thereby most certainly avoided, in the majority of cases. The incisions heal kindly and without any deformity or relaxation of the vulva, provided the puerpera remains in a healthy condition; if she suffer from colpitis or be attacked with endometritis during the puerperium, these incisions may develop into puerperal ulcers, as may all lacerations of the mucous membrane about the vulva; but they, too, heal kindly and without any great loss of substance. I have never observed any material hemorrhage from them nor have the incisions extended any further. Should either of these accidents occur, one or two sutures should be introduced at once.

Cohen's method I have once seen practiced by Ed. Martin without any result in enlarging the vulva. Its failure could be predicted from the start, since it rested on false anatomical and physiological premises: anatomically false, since tenotomy of one or both constrictores cunni—better bulbo-cavernosi—could not, as Cohen asserted, cause a relaxation of all the long muscular fibres of the sphincters of the vagina and anus, because the bulbo-cavernosus is inserted for the most part into the transverse septum of the perineum, and only a few muscular fibres of each of them cross and go to the sphincter ani externus; physiologically false, because the muscles of the perineum do not offer any active resistance by their contractions, but remain passive, and except these few fibres of the bulbo-cavernosus, the transversus perinæi is most extensively involved. The operation is entirely useless, and is to be rejected; it is very painful, and is likely to injure some of the more important blood-vessels, particularly of the corpora cavernosa. If incisions are necessary because of the presence of the hymen, or of scars, or of stenosis of the vagina, these are best made with a blunt-pointed bistoury; but only when the advancing part threatens to rupture the perineum. Many times such narrowed parts expand with surprising rapidity, and, as a rule, insignificant lacerations occur. Any septum or bridge present in the vagina which obstructs labor is to be tied with a double ligature and divided.

CHAPTER II.

The Artificial Dilatation of the Os Uteri.

LITERATURE.

Kilian: "Die operative Geburtshülfe," I, 252, 1834. Mäurer: *Centralblatt für Gynäk.*, 1887, XI, 393. Pernice: "Operationum in arte obstetricia examinatio critica et historica."

Among the methods for the induction of premature labor we have already considered the dilatation of the os by means of absorbent materials (sponge, laminaria and tupelo tents), by special dilators and by rubber bags (of *Tarnier*, *Barnes*, and others). At times it happens that dilatation of the os must be done artificially and rapidly, because the mother is in extreme danger or the os is very unyielding. This rapid dilatation, for example in placenta prævia, can be effected—

1. By drawing down an extremity, *i. e.*, one of the legs; in breech presentations we bring down a foot with two fingers; in transverse positions we first turn by Braxton-Hicks' method and then draw the breech into the cervical canal by one foot.

2. We can introduce a medium-sized colpeurynter above the internal os, fill it with water, and then slowly make traction on the bag until it slips through the os—a procedure which can be repeated several times. This method was first proposed by Mäurer (see literature).

3. Rapid manual dilatation of the cervix can be done in this manner: first one, then two, three and four fingers, and finally the whole hand are slowly forced through the cervical canal, which has been already prepared, while the fundus uteri is fixed from without by the other hand.

4. Lastly, the os can be dilated by incising it.

Kilian alleges that the oldest of these forms of operation was that of Amand, Ruysch, Morgagni and Lauverjat; he thought, however, it was possible the operation may be much older. Pernice believed that Portal, as early as 1685, had first incised the os on account of atresia. It is not long since some authors considered that this operation was a wicked mutilation of the parturient intrusted to their care; that it was followed by most disastrous results, even though the necessity for incision was present because of complete atresia of the os uteri, and though it was performed time and again by most obstetricians both on unyielding external genitals, and on the rigid os cervicis. The majority of obstetricians have long ago recognized the value of the operation for some cases and have learned to appreciate its usefulness.

Indications.—The operation is performed under the following indications:—

1. In atresia of the externl os. These cases are rare; of three that came under my observation, I ruptured the false membrane twice with my finger, and once I had to resort to the knife after waiting for several hours.

2. In cases where a septum is present at the external os, it must first be tied with two ligatures and then divided. In one case of this kind one of the ligatures slipped after the division, but no hemorrhage occurred.

3. In rigidity of the external os, if all other means, such as baths, chloral hydrate, hot douches, have failed. Incisions into the os are also called for in cases of cancer and partial induration, but not in case of sudden death of the parturient, for the purpose of delivering by accouchement forcé; here Cæsarean section is needed; they are also contraindicated in eclampsia and in placenta prævia, where they would be too dangerous on account of severe after-hemorrhage.

For this purpose, either a pair of long curved polypus scissors or a bistoury, covered up to 1 cm. from its point, is used.

The operation can be done in the lateral or in the cross-bed position. No preparation or anæsthesia is called for, since it is quite painless. With the index and middle fingers of the left hand the os is separated from the head between the pains and securely held, the scissors are introduced along the surface of the fingers and the tissue in front or behind that which has been grasped is incised to a depth of ½ to 1 cm. during a pain or in the pause between them, when the pressure of the presenting part does not incommode the operator and the length of the cut can be more accurately regulated. The operation, *per se*, is free from danger and the incisions do not extend any farther if they have been made at several points; any considerable hemorrhage is rarely met with, and if it were [illegible] occur, it could be easily controlled by hot-water injections after the termination of labor. As a rule, only a few drops of blood escape. These wounds heal kindly during the puerperium and do not call for any special after-treatment.

If the os is completely occluded, a crucial incision can first be made with the point of a scalpel, and then enlarged, and the loose flaps cut away with scissors; the latter is seldom necessary, because the pains very rapidly enlarge the opening thus made and force the presenting part through, or the dilatation can be accomplished with the index and middle fingers. Should a noticeable hemorrhage, especially arterial, follow after the removal of the placenta, a Simon's speculum must be introduced, the cervix drawn down with tenacula, and the bleeding point sutured with silk-worm gut or sublimated catgut.

The Removal of Impediments to Labor resulting from Unfavorable Position or Presentation of the Child.

The position of the child is unfavorable, not alone when it lies obliquely in utero and neither pole of its long axis is over the cervix, but also when, if the latter does occur, the presenting part is still so high that, on the occurrence of great danger to the child or mother, the extraction of the child could not be performed rapidly enough or only with increased danger to the life of the mother and child. For example, when the cord is prolapsed and the head stands high above the lesser pelvis, when the pulsations of the cord have fallen below 100 beats per minute; or in placenta prævia lateralis, while the head is freely movable, as soon as the condition of the parturient has become precarious through the loss of large quantities of blood. In such cases even the longitudinal position of the child must be reversed by turning. In like manner the engagement of the child in the pelvic inlet may be so unfavorable that this position must be changed into another one, for example, in cases of brow and face presentation with the chin directed posteriorly. Of course transverse positions most frequently call for the performance of this operation, which we term—

Version.

Definition.—By version is understood an artificial change of the presentation of the child, by which the presenting part is moved away from the pelvic inlet, and instead of it another, and that one of the poles of the long axis, is substituted, whereby, at the same time, the child's body turns about the sagittal or long or transverse axis.

If the latter qualification were not made, the drawing down of a foot in breech presentations would be a version, which is plainly not the case, since the child remains in the same position as before relative to the long axis of the uterus.

In version in [illegible]gitudinal positions, where both feet are grasped a turning on the transverse [illegible] occurs; where only one foot is seized, the body revolves on its sagittal and long axis; this is also the case in transverse presentations where one foot is pulled down.

History.—Version, and especially cephalic version, belongs to the oldest of obstetrical operations, because Hippocrates recognized the dangers of footling presentations; however, versions on one or both feet in cephalic presentations were regularly performed even during the time of Celsus. The operation then fell into oblivion, it is not easy to say why, until about the middle of the sixteenth century, when it again received due recognition under the influence of Ambroise Paré.

Although it is unquestionable that it was customary to do the operation mainly by internal manipulations, by the introduction of the whole hand into the uterus, it is certain that obstetricians in the earliest times made use of the external hand at the same time, even if it is not always so stated, as in the description given below of Moschion and Soranus. We would not be far from right in assuming, that there were physicians among the ancients who, after they had once discovered the possibility of displacing the child by the external hand, made exclusive use of external manipulation for rectifying any mal-position. J. H. Wigand (1807) is certainly the first one who elaborated this mode of improving the presentation of the child into a reliable method.

Short and explicit are the words of Moschion and Soranus on version; they read: "Si in divexum jacet infans, quid facere oportet? Si supinus vel ad dentes est leniter inmissis digitis in latus eum convertat ut accepto spatio manum suam obstetrix mittere possit ut eum facillime in integro schemate componat et quæcunque partes proximas ad orificium habuerit ipsas teneat et sic adducat. Ita tamen ut maxime caput infantis quærat et ipsum teneat; si quidem ab omnibus melior descensus per caput invenitur, sed si pedes fuerint proximiores, ipsos adprehendat et sic adducere conetur." (Sorani gynæciorum et a Dietzio repertis a Valentino Rose recognitis, pp. 88, 89, 1882.)

CHAPTER III.

Version by External Manipulations.

LITERATURE.

Dumas, L.: "De la version en général et particulièrement de la version par manœuvres externes." *Montpellier méd.*, 1886, 2 S. VII, 121. Lanchamp, P.: "Contribution à l'étude des indications et des difficultés de la version céphalique par manœuvres externes." Paris, 1885, No. 360. Leber, F. C.: "Podalic version by external manipulation in a case of dorso-posterior position of the right shoulder." *Louisville Med. News*, 1883, XV, 385. Parreno, J. F.: "De la version cephalique par manœuvres externes pendant la grossesse." Paris, 1883. Stoyanoff, G.: "De la version par manœuvres externes." Montpellier, 1883, No. 17.

The improvement of the presentation of the child by manipulations applied to the abdominal wall of the mother is not frequently employed, because its success depends on a series of conditions which are seldom all present. First, the liquor amnii must be wholly present, or have only partly escaped a short time previous, in other words, the child must still be movable. The abdominal walls must, moreover, not be too fat or too tense, otherwise the fœtal parts cannot be firmly enough grasped. The same rule applies to the contents of the abdomen, since tumors of its interior organs, ascites or impaction of fæces make it impossible to do external version. Furthermore, the uterus must not be very sensitive, since continued pressure on it is unavoidable; besides there must exist no cause that will necessitate a rapid completion of the labor, or that will render the expulsion of the child impossible in the position in which it has been artificially placed, as, for example, well-marked contraction of the pelvis. To the statement, that external version is inadmissible in cases of transverse presentations with prolapsed cord, I must take exception. For if we succeed in converting a transverse into a cephalic presentation, nothing remains to be done in the further progress of the labor, providing, of course, that the pelvis be not too narrow or the child's head too large or too hard, but to reposit the cord behind the head, and we can feel assured of saving more children and of causing less dangers to the mother by such a procedure than by the performance of internal version.

Although external version had been recommended by Wigand in 1807,* and gradually found recognition everywhere, yet it is practiced much more seldom than it deserves, and than its indications call for. Among 6555 operations performed in maternity hospitals, it figures only eight times; while, on the contrary, internal version was done no less than 1106 times. A reason for this infrequent use is probably this, that not enough attention has been paid to external examinations until recent years. Ed. Martin ("Zur Gynäkologie," Heft II, Aeussere Wendung, p. 25) could collect only 31 cases of this operation up to the close of the year 1849; in these all the mothers lived and only two children died, really in spite of the change of position—a result which is decidedly better than that of internal version.

The best *time for the operation* is unquestionably at the end of the first stage of labor or immediately after the rupture of the membranes; yet in the latter case the external manipulations must not be continued too long, because otherwise more of the liquor amnii escapes and the uterus contracts more closely and more firmly about the fœtus; and thus internal version subsequently is also made more difficult. At times all the requisite conditions may be fulfilled, and in spite of quiet and perseverance the operation is unsuccessful.

Indications for external version are: 1. Transverse positions of the child, if the latter is viable or fully developed; 2. Longitudinal positions, if another longitudinal position is more favorable for mother and child than the existing one, *e. g.*, a breech position of the second twin, or an oblique engagement of the breech, or a head presentation in contracted pelvis, *e. g.*, in case the occiput rested above the contracted half of the pelvis.

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* Grueb was mistaken in stating that Scipio Mercurius had already given a fairly complete description of Wigand's method of external version. Scipio Mercurius only advised that the external hand should assist in the turning of the child, while the internal hand pushed back the shoulder.

The operation is performed in the following manner: The woman lies on the back, without being anæsthetized, because the manipulations are, as a rule, little if at all painful; the upper half of the body must not be too high. The operator stands on the free side of the bed and with one hand grasps the pole of the child that lies near the pelvic inlet, with the other he seizes the upper pole. If he stands on the right side of the parturient the right hand grasps the deeper lying part, and by an even, steady counter-pressure on the part which lies higher, the latter is forced into the pelvic inlet between the pains. If a pain occurs, he stops and forbids the parturient to bear down.

Since in general cephalic version has decided advantages over podalic, one should always first lead the head toward the introitus of the pelvis, even if it be a little higher than the breech. Only in cases where this is unsuccessful should one be satisfied with the engagement of the breech in it. The method proposed by Nivert, to push the deeper-lying part with both hands over the os, may do well for those cases in which it is not especially movable; in all others the change of position is more easily brought about by manipulating both ends of the child. If the version is successful, one hand must fix from without the engaged part and the other one examines internally to find if it is to be felt in the cervix and in what position it is, and will eventually improve the latter with the aid of the external hand, by pressing the occiput still lower down. If neither extremities nor the cord have prolapsed, and the engaged part of the child remains during and between the pains above the os, the labor may be left to nature; if, however, it should slip away, the membranes should be ruptured between the pains, and the liquor amnii be allowed to escape slowly, thus fixing the part.

As soon as the operation is completed, the parturient may remain on the back, or, if the presenting part is not quite fixed, she must be placed on that side from which it was brought down into the cervix; at the same time a pillow must be placed under the uterus, lest it sink too much to one side.

CHAPTER IV.

Combined Indirect Version. The Methods of Hohl and Braxton Hicks.

LITERATURE.

Auvard: *Bulletin Méd.*, Paris, 1887, I, 547. Degoul, P. L.: "De la version podalique, etc." Paris, 1885. Doléris: "De la version podalique partielle par manœuvres internes et externes combinées; procédé de Braxton Hicks." *Ann. de Gynéc.*, 1885, XXIII, 333–355.

If external version should fail, whether it be because of too great tenderness of the uterus or too limited mobility of the child or for any other reason, then the combined external and internal version of Braxton Hicks* should be employed—a manipulation which ranks next to the former in the absence of violence. This method, which requires the same conditions as the previous one, had been already recommended by Hohl (1845) as follows ("Vorträge," 1845, S. 189, und II. Aufl., 1862, S. 789). The parturient lies on the back and the operator stands on the side where the breech is; an assistant raises the fundus uteri on the side in which the head lies, while the operator grasps the latter from without with the hand corresponding to its side and passes the index and middle fingers of the other hand through the cervix on to the shoulder, which he pushes aside toward the breech, and at the same time he directs the head toward the pelvic inlet. The membranes are ruptured after the completion of the version. Hohl had described this method as early as 1845; John Hardin, however, first designated it as his method in 1857.

Braxton Hicks' method consists in this, that the woman, without being anæsthetized, is placed on the back and the physician introduces the fingers of the hand which corresponds to the side toward which the head is directed, on to the presenting part. With the other hand he grasps from without that part of the child—generally the head—which is to be brought into the os, and while he pushes this in the direction of the latter, he advances with one or two fingers of the other hand through the os as far as the presenting side or shoulder, and pushes it gradually to the opposite side; this can be done just as well before as after the rupture of the membranes. If the arm is prolapsed, Braxton Hicks flexes it and pushes it up over the anterior surface of the thorax. If an artificial termination of the labor is to be anticipated, the breech and not the head must be pushed down with the external hand into the pelvic inlet, and with the two fingers in the uterus the shoulder must be pushed from the pelvic inlet toward the side where the head lies, until the knee and then the foot come over the os, when they are drawn through the cervix.

This method has the decided advantage over all the other internal versions, cephalic or podalic, that it can be performed at the commencement of labor, long before the os is completely dilated, and that it obviates the necessity of introducing the whole hand into the uterus, which is not without danger for the parturient and the child.

If the desired fœtal part has been made to engage, according to circumstances, the further progress of the labor may be left entirely to nature or the membranes ruptured, as in external version. The results of the method are quite as good as those of external version, especially in placenta prævia, as stated above. A method of operation akin to it, which I have performed once in my thirty cases, and which Hecker has likewise recommended, is the so-called internal version without the introduction of the whole hand.

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* Kueneke: "Die combinirte äussere und innere Wendung von Braxton Hicks," Göttingen, 1886.

This method is suitable for cases in which the cervix is not yet sufficiently dilated to permit of the introduction of the entire hand without considerable difficulty, and both of the previously-described methods have failed in changing the position of the child, because the uterus was too firmly contracted. It is based upon the fact, that if one shoulder of the child presents, and the position of the lower extremities is normal, the knee corresponding to the presenting side rests on the belly in the neighborhood of the child's thorax, and must be within reach of two or four fingers introduced as far as the knuckles. For this purpose the external hand should strongly force down the breech of the child and thereby bring the knee nearer to the os; the half of the other hand is introduced into the vagina and through the os to the presenting part up to the knee, which is hooked with the middle finger and drawn down into the vagina, in order to complete the engagement of the breech with it. In my case this succeeded very well, although the uterus was firmly contracted around the child and attempts at version with another method had been made in vain by another practitioner.

If even this method fails to accomplish the desired end, or if it does not appear advisable, for certain reasons, we must finally resort to combined direct version by the introduction of the whole hand.

CHAPTER V.

Combined Direct Version by the Introduction of the Whole Hand.

LITERATURE.

Kufferath, E.: "De la version cephalique." *Clinique Bruxelle*, 1887, I, 333–342.

The version may be either on the head or the breech or the feet.

(A) *Internal cephalic version* can only be done under the following circumstances: The pelvis must not be contracted to such an extent that the head cannot be delivered undiminished in size; there must be no cause present that may necessitate the rapid completion of labor; as has been stated above, I do not consider prolapse of the cord a contra-indication to cephalic version. The cervix must not be partially, but completely, or in multiparæ almost completely, dilated. If these conditions are fulfilled, the reports of Hueter prove that the operation deserves the preference over internal podalic version; by it 56 out of 58 women were saved and 41 children were born alive. Since it presupposes more conditions than external cephalic version, and besides is more painful and places the mother in greater danger, it will be less often performed than the latter, and only when this and Braxton Hicks' method have failed.

Direct internal cephalic version is *indicated* when both external alone and combined external and internal have been unsuccessful, in transverse positions or in longitudinal positions, such as pelvic presentations which are less favorable than vertex positions. I have performed the operation only twice among 150 cases of version.

It is *performed* in the following manner: The patient is anæsthetized, as soon as the cervix is sufficiently dilated, in the dorsal or lateral position on an ordinary bed, a hard pillow being placed under the pelvis. The bladder is emptied by means of a catheter. Then, according to—

(*a*) The practice of D'Outrepont, or the *indirect method*, the head is seized from without by the hand corresponding to it (thus in the position on the left side with the right hand), while the other one, well oiled and folded together like a cone, is introduced through vulva, vagina and os uteri by carefully rotating it, grasps the presenting shoulder and pushes it away toward the side on which the breech is. At the same time the head from without is directed over the os cervicis. By this means the child can many times be placed into a vertex position, even after the liquor amnii has escaped a long time.

(*β*) In the method of Busch, the *direct one*, the head is grasped fully and firmly by the hand corresponding to it (*e. g.*, if it lies on the right side, by the left hand), which is introduced through the cervix, and then, while the external hand pushes the breech of the child further up, drawn down into the cervix. The thumb and little finger grasp the temples and the three remaining fingers the neck over the occiput, so that the latter is brought deep into the small pelvis by the traction. The deeper the head is drawn down the better, for then extraction with the forceps would be much easier, should any danger threaten the child.

In the Vienna school—similar to the practice of Hohl (see above)—the head is first pushed toward the pelvic inlet and then grasped with the hand and drawn down.

Both of these methods were by no means first discovered by Busch and D'Outrepont, but had been performed in the most ancient times, when podalic version was considered much more dangerous. Scipio Mercurius advised that, while the hand introduced into the uterus pushed back the presenting shoulder, the external hand should at the same time assist in turning the child; that is, he recommended the D'Outrepont method. Further, for example, Mme. Siegemund has illustrated the Busch method in a case of prolapsed arm with the head high up, and according to Schroeder (compare page 343), Louise Bourgeois had pushed the neck and shoulder of the child from the pelvic inlet; so that she was apparently acquainted with a method similar to D'Outrepont's.

Should it be impossible to bring the child's head down, then there still remains

(B) *Combined direct version on the pelvic extremity, that is, on one or both feet.* Internal Podalic V.

LITERATURE.

Grossholz: *Lancet*, London, 1883, II, 230. Grisel, A.: "Contribution à l'étude de la version dans les bassins rétrécits." Paris, 1884. Lawrence: "Podalic Version, its Place in Obstetrics." Edinb., 1885. Schultze, B. S.: "Anleitung zur Wendung auf den Fuss, u. s. w." Leipzig, 1885, Engelmann. Pajot: "Transformation de la présentation pelvienne en présentation du sommet." *Gaz. des hôp.*, 1887, LX, 18.

Labors in complete breech presentations have no real advantage over those in which one foot is in advance of it; on the contrary, the latter are much more favorable, in that the child may often be saved by rapid extraction by the prolapsed foot, in case its safety should be jeopardized, while delivery by the pelvis is very difficult and much time is often lost in accomplishing it. For these reasons, if the head cannot be brought down by internal version, one should never pull down the breech alone, but always at least one foot.

This operation is also very old. Hippocrates was acquainted only with cephalic version, and would have strongly opposed turning on the feet, since he held that footling presentations were very dangerous for mother and child. Celsus, however (Liber VII, cap. xxix), was familiar with podalic version, yet he used it only on dead children. In the sixteenth century Philumenos and Aetius recommended cephalic and podalic versions in transverse positions. If podalic version did not succeed, two hooks, unci attractorii, were applied, one on each side, and the head was extracted with them. From that time it was forgotten and cephalic version was alone retained, until in 1550, Ambrose Paré, whose pupil, Peter Franko, had already advised but had never himself performed it, brought it again into practice, and his pupils Guillemeau and later Mauriceau (1668) and de la Motte (1721) demonstrated its great advantages over all other methods in certain cases, so that for the time it forced cephalic version into complete oblivion. Moreover, until the beginning of this century, podalic version, that is to say, improvement of the position of the child, was never performed alone, but was always concluded by extraction. First Boer, then Wenzel, and especially Jörg (Leipzig) have separated extraction from version.

Indications.—The indications for direct internal version on one or both feet are:—

1. *Transverse position*, if the child is more than 28 weeks old, whether it be living or not; for even in the latter case version, as the milder measure, is to be chosen in preference to embryotomy. Only when a fœtus of this

age is very much macerated might its extraction be attempted in a manner resembling so-called spontaneous evolution.

2. In normal pelves and *vertex presentations*, if the forceps cannot be applied to the head, and the mother's or child's life be threatened.

3. In *flat pelves* of the first or second degree, when the head does not engage and changes its position frequently above the pelvis; or if vertex presentations have been unfavorable in previous deliveries and breech presentations have terminated better for mother and child.

4. In *obliquely contracted pelves* and unsuccessful or unfavorable engagement of the head—occiput over the contracted side.

5. In *brow and face positions* with the chin directed posteriorly, as soon as any danger threatens the mother or child, while the head is still at the pelvic inlet.

6. In *prolapse of one or more extremities* and head presenting, if the labor must be rapidly completed.

7. *After perforation, cephalotripsy* or *craniotomy*, if extraction by the head is unsuccessful.

8. In case of *double monstrosities*, or conjoined twins, if extraction by the presenting head or feet does not succeed.

Contra-indicated is every attempt at version if Bandl's ring is retracted from 5–7.5 cm. above the symphysis and the body of the uterus above it feels like a bullet, because a rupture is almost certain to occur when such an excessive expansion of the cervix exists.

The conditions which necessarily must be present for the performance of internal podalic version are rather numerous. (1) First of all, it is, of course, taken for granted that the pelvis must be so roomy that the hand can be comfortably introduced through it, so as to securely grasp a fœtal part. For, if we could force the hand through only with great effort, it would be wholly impossible to draw the child's body through it, even after the death of the fœtus, and then the Cæsarean section remains as the only alternative, unless the cause of the contraction (*e. g.*, an ovarian or other tumor) could be reduced in size or pushed to one side.

Furthermore, (2) the cervix must be fully, or in multiparæ almost completely, dilated, so that the introduction of the hand into the uterus does not lacerate it. In some infrequent cases, where great danger for the mother and child would be caused by long delay in the delivery, the hand may be forced through a cervix 5 cm. across, especially in multiparæ, and the version completed with success. In such cases it is doubly indicated to proceed very slowly with the extraction of the child, because the cervix would offer such serious obstacles to the after-coming head that not only would the child's life be almost certainly sacrificed, but that of the mother would also be much more endangered.

(3) The uterus must not be tetanically contracted around the child, for

every attempt to enter it would then be in vain and be associated with the danger of a rupture, more particularly its avulsion from the vault of the vagina.

(4) The mother must not be moribund; for in such cases we cannot save her by version, and the fœtal life only when the Cæsarean section is done a few minutes after the death of the former, while the child will certainly die during the long, tedious version and extraction.

(5) The child must be so large that a danger for the mother results from it transverse position, or, in other words, small non-viable children, that is, fœtuses under seven months, or such as are already macerated, should not be turned, because we thereby expose the parturient to a danger and accomplish nothing for the child, and because such children can be born either by spontaneous version or with doubled-up body without any lesions of the maternal soft parts.

In cases in which the liquor amnii has escaped early, the dilatation of the cervix advances slowly, and the presenting part is not too deeply engaged (that is, has not passed through the os cervicis), the uterine contractions can be regulated by the introduction of a colpeurynter, which prevents the complete escape of the water, and the cervix is better prepared for the passage of the hand and the child.

Operation.—The operation can be commenced only when we have prepared a satisfactory position for its performance, have secured the necessary assistants, and have at hand the requisite restoratives and instruments.

Concerning the position of the parturient, the remark holds good here, as in every other branch of medicine, and more particularly in obstetrics, that one should understand how to operate in every position of the patient; that is to say, in the cross-bed position as well as on the ordinary bed; in the dorsal as also in the lateral and knee-elbow positions of the woman. Each of these positions has its strong advocates, because every author recommends most highly the one with which he is most familiar. And the same rule applies to the position of the parturient during version, as to the use of the various forceps: adhere to that with which you are most familiar.

To those, however, who are just beginning their obstetrical practice and have not yet accustomed themselves to any particular position of the parturient, I advise, as does E. Martin, by preference to select the lateral position; the patient is to lie on the side on which the child's feet are. The advantages of this position have been already discussed in detail on page 607. For the easier cases, for example, where the membranes are still intact, the longitudinal position in the ordinary bed can be employed, only the pelvis should be somewhat elevated by a hard pillow placed under it. If the position has been arranged, the operation can be begun without the use of chloroform, in multiparæ with large pelves and with roomy, yielding genital organs, if they are not too unreasonable and willing to bear the pain. The utensils required, as towels, basins with hot and cold water, all necessary instruments, such as a catheter, slings, tapes and scissors for the cord, a hypodermatic syringe and some means of resuscitation, as cold water and some wine, are to be placed in close proximity, so that they can be readily reached. That a full bladder is to be emptied, and that a vaginal douche of 1–1000 sublimate solution is to be given previous to the introduction of the hand into the genitals, applies here as everywhere else, and moreover the operation must not be commenced without the most scrupulous disinfection of the hand and forearm.

In the majority of cases chloroform cannot be dispensed with. If the liquor amnii has escaped some time previously, it will be necessary to anæsthetize the parturient pretty deeply; if this is not the case, it suffices to let her inhale it until she no longer reacts to the introduction of the hand into the vulva.

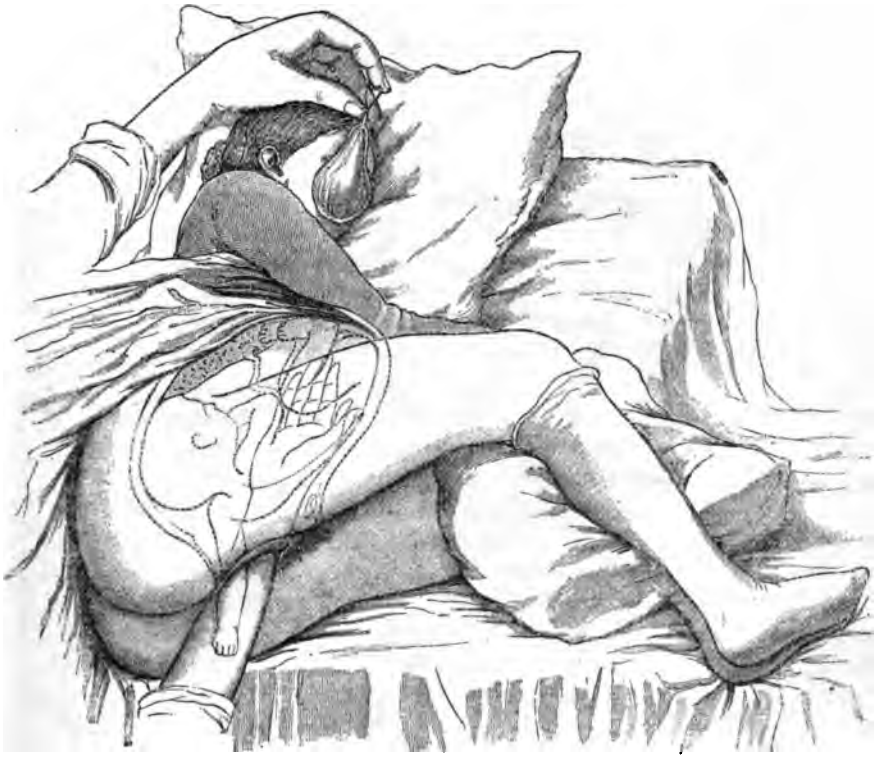
The chloroform may be administered until the breech has been brought down into the small pelvis, bnt only in those cases in which it is anticipated that the turning of the child is going to be difficult. I do not agree with Hegar, Kristeller and K. Schröder, who advise that the operator should stand behind the woman if the back of the child lies posteriorly, and in front in the opposite condition, because I have convinced myself in very many cases that the feet, whether they are directed to the front or the back, can be grasped just as easily and securely in the lateral position of the parturient, provided we proceed along the inferior side of the child.

The *choice of the hand* in the lateral position is self-evident: we always introduce the hand which corresponds to that side on which the woman lies, thus, the right in the left side position, and *vice versâ* (Fig. 137). The shirt sleeve of the operating arm must be rolled back above the elbow and the whole forearm and the back of the lower third of the arm well smeared with vaseline or a one-per-cent. ointment of creoline, whereby an inconvenient rolling in of the vulva into the vagina during the version is prevented.

One hand, folded in the form of a cone, passes carefully and slowly with a rotary motion through the vulva, the lips of which are separated with the other; then the external hand is carried to the fundus uteri, which it fixes, while the inner one is cautiously forced through the os and cervix, the back of the hand being turned to one side. If a fœtal part lies in the orifice, pass the hand along its lower surface as far as the knee which corresponds to the presenting side. I do not permit the hand to leave the side, because the cord can very easily be compressed in going along the belly, and the upper knee is more liable to be grasped. We can reach the knee more easily if the external hand forces the breech toward the inner, operating one (Fig. 138). If the membranes have not broken, the bag of waters is first ruptured at the knee and the leg of the child is drawn down by grasping it with the whole hand and drawing it forward, between the pains, over the anterior surface of the child (Fig. 139). At the same time the external hand pushes the head of the child up toward the fundus uteri.

If the liquor amnii has escaped but a short time previously, the turning of the child, in most cases, is effected easily by means of one foot, best the one which corresponds to the presenting side (Fig. 138). Simpson and others have advised to draw down the upper foot, in order to turn the child at the same time on its long axis and thereby more easily to engage the breech; this, according to my experience, is only advisable in the case of freely movable children, otherwise the version of the child by the upper foot is decidedly more difficult and more hazardous for the child, since it is a more complicated operation than by seizing the lower foot. In the latter mode, only a revolution of the child about its sagittal axis occurs, to which, later, is added one about its long axis when the hip which has been brought down

FIG. 137.



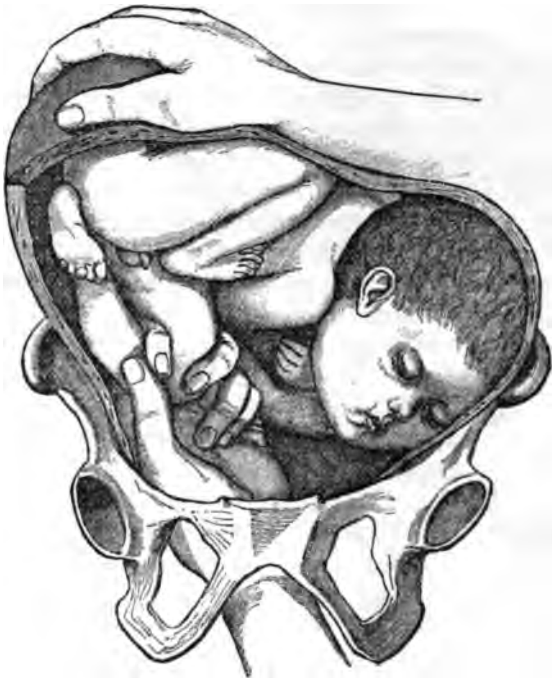
Transverse Position, II a.

The operator administers the chloroform, while one hand is in the uterus (see page 608).

engages under the symphysis. In the former method, on the contrary, first a revolution about the long axis, then one about the sagittal axis, and finally a third revolution about the long axis of the child occurs, during which the lower hip is easily displaced above the pelvic inlet and wedged against it; thus, on the one hand, the engagement of the breech is made more difficult, and on the other, a disastrous lifting of the arms from the thorax is produced. These faulty results may be easily demonstrated on the manikin (see Fig. 139).

If the version is to be immediately followed by extraction, the uterus is very firmly contracted around the child and turning is likely to be difficult, then it is well to proceed directly from the under knee or foot to the upper and, after having seized them both firmly, to draw them slowly down. It is pedantic to describe accurately in what manner the feet shall be grasped; they should be seized so firmly that they will not slip away from the operator when making traction.

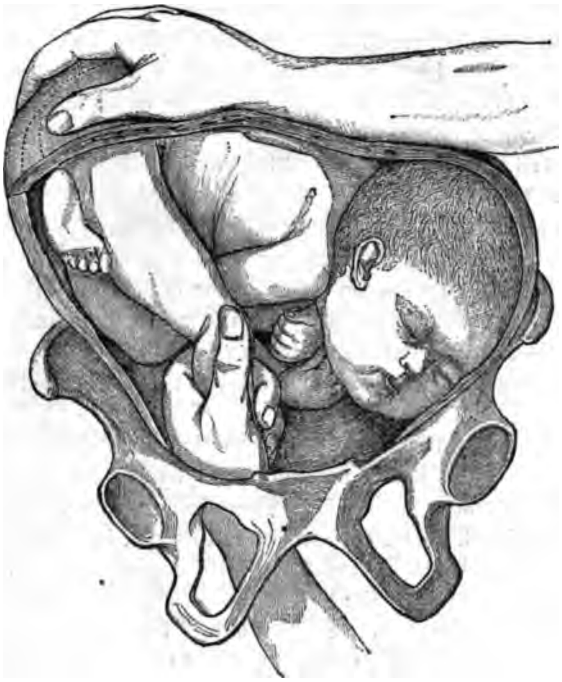
FIG. 138.



Transverse Position I b. Seizure of the left knee with the left hand.

If a hand lies in the os or an arm in the vagina, that is, after the membranes have ruptured, when the operation is to be commenced, these parts must first be secured with a sling, before the hand passes into the uterus. For this purpose a silk sling or a linen bandage of medium size is taken and a loop of it placed over two to four fingers of the hand selected for the operation, which is introduced in the vagina; the prolapsed part is seized and, with the assistance of the thumb, the loop is slipped off the fingers over the hand of the child and made fast to its wrist by traction. If the arm is very deeply prolapsed, the hand may be secured within or outside of the external genitals. A sling carrier, for carrying it up to the fœtal part, can almost always be dispensed with.

FIG. 139.



Transverse Position I b. The upper foot is seized with the left hand and drawn down.

If the operator has secured a foot and drawn it down without succeeding in turning the child, he must secure this also with a sling. For this purpose he lets the midwife pass a sling through a carrier, for example, that of Trefurt, and pushes this into the palm of the hand which holds the foot of the child; with the thumb and index finger he then loosens the sling from the carrier, withdraws the latter and passes the noose over the foot around the child's ankle; then it is drawn together, while the fingers adjust it, so that it cannot slip. He then proceeds to get the other foot so that he can complete the version of the child by drawing on it and the sling at the same time.

It is necessary in this, the most important part of the operation, the version proper, and in drawing down of the breech, to make traction slowly and regularly and in the proper direction. If the breech is to enter the pelvic inlet from the left, the extremity which has been seized will be drawn more to the right, and *vice versa*. If we are unsuccessful in engaging it in this manner, we must examine oftener with the finger, to find where the breech is and modify our traction according to its position. The traction should not be so strong and jerky as to cause a laceration of the muscles or ligaments of the child, or to fracture its bones.

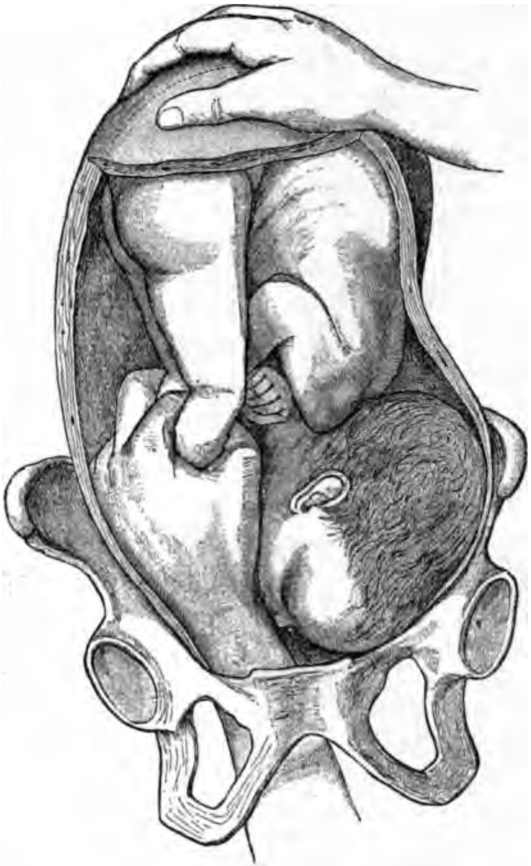
The version is to be considered successful only when the child's breech is in the os cervicis or, at least, has entered the pelvic inlet. If we consider it completed when the feet are in either of those places, and leave the expulsion to nature, it may happen that the breech will be continually jammed against the iliac bone, that the expulsion of the child will not proceed, in spite of the strongest pains, and the mother and child be thereby placed in unnecessary peril. The breech may still remain wholly above the pelvic inlet, even when the foot and a part of the leg are visible outside of the external genitals. As soon as the breech is actually in the small pelvis, the sling is removed from the foot, and the further expulsion of the child can then be left to nature, unless some indication exists for the rapid completion of delivery. Under these circumstances, the parturient is laid on her back and preparations for a cross-bed position are made, to permit giving the necessary assistance in case the arms become separated from the thorax and for the delivery of the head.

The earlier practice of performing extraction immediately after the version has recently again been recommended by Winter, with this qualification, that the commencement of the operation is to be postponed until the cervix is fully dilated. The exceptions to this are, in placenta prævia, in septic infection *sub partu*, in beginning intra-uterine asphyxia of the child and in extreme dilatation of the lower uterine segment, when version may be performed before the complete dilatation of the cervix and then we may wait (*Centralbl. für Gynäk.*, 1886, pp. 60, 61). I agree fully with the opinion of Dohrn, who is opposed to this method (*Zeitschr. f. Geburtsh. und Gynäk.*, XIV, 72, 1887).

While we have previously described the practice in the easier cases of version, there are other and not infrequent instances in which some special methods of operation are called for, because of neglected and impacted transverse positions.

In such cases one of two conditions is generally present: either the fœtus has become impacted too deeply into the lower uterine segment and the small pelvis, because no professional assistance was at hand, or tetanus of the uterus has been caused by the vain attempts of other operators, during which, for example, a foot has been brought into the cervix, but the version could not be completed. Such cases must be deeply chloroformed and the hand passed into the uterus, line by line, with great patience and extreme care for the soft parts; both feet are to be grasped and the attempt made to turn the child slowly. Sometimes it happens, even if both feet are grasped, that the version cannot be completed without further interference, by reason of the extreme contraction of the uterus about the child.

FIG. 140.



First Face Position. Chin high up and directed posteriorly; version with the left hand by both feet.

In such a case it has been advised to pass a sling around the second foot and then to perform the so-called *double manipulation.* This consists of drawing down the feet by means of both slings with the external hand and at the same time pushing back with the internal one the fœtal part which has become wedged in the cervix, usually the shoulder, so that room is made for the downward passage of the breech into the cervix. Of course, this can be done only with great care, lest the uterus be torn away from the vault of the vagina, and generally it will succeed but slowly and painfully; however, it is effective.

I have never been in a position to make use of *lateral quarter-version* recommended by Levret and Deutsch, the object of which is, so to grasp the body of the child, which lies in an unfavorable position with the feet above in the fundus uteri, that the thumb lies over the back and the four fingers over the breast, and then to rotate the thorax in such a manner that the feet come farther to the front, or, better, to the back, and can thus be more easily grasped. Irrespective of the fact that, ordinarily, one side of the child lies underneath, and the feet are therefore directed to the front or back of the uterus, it is all the same, in the lateral position of the woman, whether they are directed more anteriorly, posteriorly or superiorly; they are always equally easy to reach and to grasp if the uterus has not contracted too firmly around the child. Should this be the case, the method of Levret and Deutsch would fail to accomplish its end, because it certainly would be impossible to turn the child in that event.

In some cases the introduction of the hand on the side which corresponds to the position of the feet is not suitable; for example, if the placenta be attached on that side of the cervix.

Here the parturient is placed on the back or on the side which corresponds to the position of the head, and the operator passes the corresponding hand along the presenting shoulder and side up to the knee, while he raises the fundus uteri and pushes it over toward the opposite side, as shown in Fig. 141.

If the attempt to find the foot is difficult because the waters have escaped some time previously, Kilian, Scanzoni, Blundell and Spöndli advise changing the parturient from the dorsal to the lateral position after the hand has been introduced into the uterus; for this purpose the upper leg must be lifted over the hand that is in the uterus.

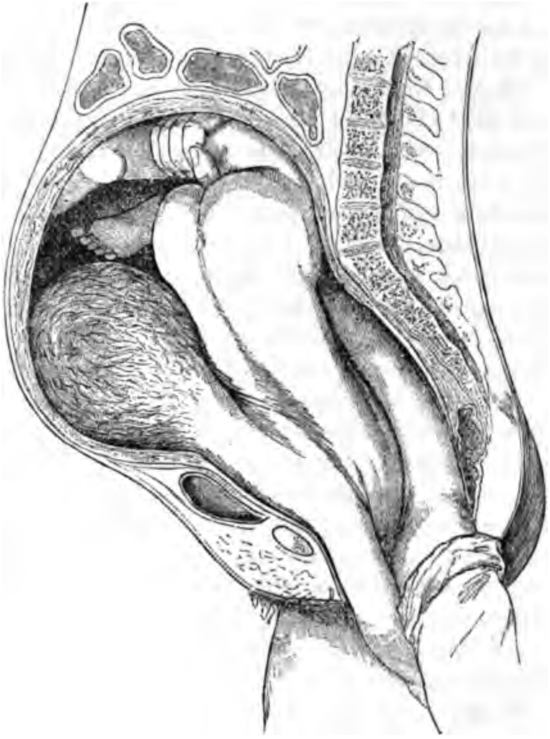
Simpson, Ramsbotham and others, in very difficult cases and in left lateral position, used the left hand to seek for the feet, while the right fixed the fundus uteri. Again, others recommended for all cases the knee-elbow positon as the best, *e. g.*, Hildreth, Ritgen and others. Yet this proposal and method of operation have found few supporters.

If the child is extremely compressed, so that we can scarcely separate one finger from another in the uterus, it is often advisable to draw down the knee alone, and to extend the leg after the foot has passed through the os cervicis (see Fig. 138). In some cases the uterine contractions were so powerful that my hand, the tip of which just touched the knee, was completely paralyzed; I removed it cautiously and introduced the other one, seized the knee, and was successful in turning the child.

For those cases in which it is absolutely impossible to force the hand past presenting arm and shoulder into the uterus, four other operations have proposed, only one of which we shall here consider.

mputation of the arm by disarticulation ~~was~~ much used in ancient times, has again, more recently, been now and then practiced, *e.g.*, by Levy, openhagen. The great majority of recent authors have justly opposed operation, because it is not the arm but the uterine contractions which ent the introduction of the hand, and the tetanus of the uterus must fore be overcome; furthermore, the arm affords us a very important for the extraction of the child. Besides, it happened repeatedly that ing child was born after the prolapsed arm had been torn off, and the lated party afterward sued his preserver for malpractice.

FIG. 141.



Transverse Position. I b.

The right hand is introduced on the left side on account of right-sided cervical obstruction.

me cases are also reported in the literature in which, after the disarticun of the arm, version occurred naturally and a spontaneous delivery fold, for example, Wittcke's case (*Siebold's Journal*, XVI). Still, this does rove that such a result would have happened without the disarticulation.

The arm can be detached from the joint, in most cases, by a blunt-pointed scalpel or scissors. Levy separated it, along with the scapula, by a pair of Smellie's scissors.

Recently this operation has again been performed, but, of course, only on the dead child. Lwow, of Kasan, in a case of transverse position, detached first the arm and shoulder, then emptied the thorax and abdomen, and finally extracted the child by the feet. Huber, of Memmingen (*Münchener ärztl. Intelligenzblatt*, 1883, Nr. 37), also found it necessary, after opening the thorax, to remove the prolapsed arm, in order to pass Braun's blunt hook around the neck for decapitation, which then was easy of performance.

I myself was once compelled to remove both arms and then decapitate, in a 27-year-old IIIpara, whose parturient canal was extremely narrow, and both arms of the dead child had been brought down, probably in attempts at version. This was necessary previous to the decapitation, because otherwise I could not reach the body of the child, on account of the extreme swelling and narrowness of the soft parts. The woman recovered; the child weighed 3100 gm. (1881, No. 395). In speaking of the prognosis in transverse positions we have already given the results of version for mother and child; it only remains to add here that, properly, the question could concern only the results of version with immediate extraction. The significance of version in its relation to subsequent disease and mortality of the mother and child is very hard to establish with accuracy.

Even in cases in which extraction is not done, but the child is born spontaneously, the dangers of the prolonged delivery, and especially of a breech delivery, are to be considered in estimating the results of the improved position; how much more, then, are the mother and child endangered if the version is followed by extraction. The version in itself is not of great moment, if all of the conditions are fulfilled and it is performed with care. Sometimes the introduction of the hand excites abnormally severe contractions and even strictures, and then the movement of the hand, as well as the turning of the child, are associated with marked irritation of the wall of the uterus. Most dangerous of all is a repeated laborious effort to introduce the hand into the firmly contracted uterus: uterine lacerations, hemorrhages into its walls, phlegmon and the formation of abscesses may all result from this.

It may be said that the shorter the duration of the operation and the more rapidly the version is effected, the less dangerous it is. When the efforts to seize the foot are prolonged, the version more difficult, and the auxiliary measures more numerous (passing the sling over one foot, the double manipulation, a change of hands), the prognosis will be proportionately worse. Of course, during version the operator is liable to infect the parturient by his hand.

CHAPTER VI.

External and Internal Manipulations for the Conversion of a Brow or Face Presentation into a Vertex.

LITERATURE.

Brennecke: *Berl. klin. Wochenschrift*, 1882, No. 4. Fritsch: *Berl. klin. Wochenschrift*, 1872, p. 385. Humphrey: *Amer. Journal Med. Sciences*, 1877, Jan., p. 126. Kolosser: "Ueber Gesichtslagen und deren manuelle Umwandlung in Hinterhauptslagen." I. D., Halle, 1880. Mann, J.: *Centralbl. f. Gynäk.*, 1880, p. 607. Partridge: *New York Med. Journal*, March, 1887, and *Amer. Journ. of Obstet.*, 1884, p. 593. Pippingskjöld: "Beiträge zur Geburtsh. und Gynäkologie der Berl. geburtsh. Gesellschaft," 1872, p. 286. Schatz: *Archiv f. Gynäk.*, v, 306. Melponer: *Archiv f. Gynäk.*, xi, 346. Ziegenspeck: "Beitrag zur Behandlung der Gesichtslagen." "Volkmann's Sammlung klin. Vorträge," No. 284. *Gynäkologie*, No. 80.

Historical Notes.—There was a time when face presentations were looked upon as very dangerous, and only to be completed by artificial means. Baudelocque recommended their conversion into vertex positions. The forceps, version and the displacement of the occiput by the hand or with the blade of a forceps, were much in use at the beginning of this century for the improvement of face presentations. First Mme. Lachapelle, Paul Dubois, Zeller, and J. L. Boer pointed out the impropriety of this practice, and the latter portrayed very vividly how he had learned that face presentations were even favorable in childbirth, and in and of themselves by no means demanded operative interference. Thus it happened that, about the middle of the present century, the conversion of a face into an occipital position—Rosshirt (1842) of Tübingen, and Cazeaux (1858) of Paris, excepted—was forbidden among obstetricians, when Pippingskjöld, 1872, published an interesting case of a 25-year-old primipara who had been in labor three days with a face presentation, where he succeeded in converting it into a vertex position by means of Baudelocque's method and the forceps, and he delivered the woman of a living child. Then Schatz, in 1873, advanced a new proposition for the conversion of face into vertex presentation, which has received the approbation of various authors, and has stimulated a renewed discussion of the question.

A faulty engagement of the head with the chin directed posteriorly would be the only indication for such an operation, when the child is large and the pains not strong.

The *conditions* are: Mobility and high position of the head, not too narrow a pelvis, and absence of any indication which calls for the rapid completion of the labor.

The *operation* is performed without anæsthesia, the parturient lying on the back; the operator stands on the side toward which the occiput is directed. Between the pains the anterior shoulder, which is easily felt, is grasped with the hand corresponding to it, and at the same time the breech with the other one; while an even strong pressure is exerted upon the shoulder in the direction of the occiput and somewhat upward, the breech should be pressed upward, and then toward the anterior surface of the child. At first both hands press at a right angle to each other, then parallel but in opposite directions, and finally the breech is pressed downward and toward the side. During the pains all manipulations cease, and the head is fixed from without by an assistant. To complete the fixation of the occiput, when brought into place, either the woman is placed on the side corresponding to the anterior abdominal wall of the child, or else the membranes are ruptured.

Besides Schatz, Welponer operated successfully in this manner on one case, while Fritsch and he failed each in one case, and the former accomplished the desired end by combined manipulations.

Four additional cases have been published by Kolosser, from the Clinic in Halle, in which Schatz's method was not once successful.

On the other hand, Brennecke has performed Schatz's operation with good results. He says, concerning it, at the commencement the head turns easily, then comes a dead stop; any further progress is only possible with greater muscular strain, and many times it appears impossible. This is due to the resistance which the uterus opposes to the necessary lengthening of its vertical axis during the manipulations; chloroform would easily overcome this obstacle. In general, the method will be confined to maternity hospitals, where it can be done before the rupture of the membranes, while in private practice the physician seldom reaches the parturient in time.

Should Schatz's method of conversion fail, we can effect the downward displacement of the occiput by *combined external and internal manipulations*. Baudelocque describes the method in the following manner: (1) The operator stands on the side of the fœtal occiput, passes the hand corresponding to the face of the child to the upper jaw, or grasps the whole face and forces it away from the pelvic inlet in the direction of the chin, while the external hand presses the occiput down into the pelvic strait. Before he removes the hand which has been introduced into the uterus, he ascertains that the large fontanelle actually stands higher than the small one, and that the occiput is completely within the small pelvis.

Or—likewise according to Baudelocque—(2) The operator stands on the side toward which the chin and breast lie, and passes over the occiput with the hand that corresponds to it, grasps it completely and pulls it down with an even traction, while with the external hand he pushes the chest of the child from below upward and to the opposite side. Partridge operated successfully in this manner four times out of five. While frequently a brow presentation arises by Baudelocque's method and the complete replacement of the head not rarely fails, as the published cases of Kolosser from the clinic at Halle show, yet this second direct method of drawing down the occiput was performed with a favorable result for both mother and child in Kesmarsky's clinic at Budapest in a case of face presentation, in which both forceps and version had been attempted in vain, and the child's neck was firmly compressed by the external os; its weight was 3600 gm. J. R. Humphrey has also used this direct internal manipulation, especially in the knee-elbow position of the patient.

Concerning the relation which these three methods bear toward each other, they should follow one another in the order in which they have been described: First Schatz's; if this fails, Baudelocque's, since, with this, the cervix need only be dilated sufficiently to permit the passage of two fingers; and finally, the method of Playfair, Partridge-Humphrey, because this requires the longest preparation, complete dilatation of the cervix, and the use of chloroform. Of these methods, that of Schatz is the least dangerous, and the last-named one the most effective, because at least half of the hand must be passed in the uterus. Pressure on the cord, premature fœtal respirations, lacerations and infection of the maternal soft parts may occur. Still it is possible to succeed even in cases where the child is firmly encircled by the uterus, provided the pelvis is not too narrow and no immediate danger for mother or child is present. And such cases, in which there is no prospect that the chin will rotate from behind forward, are by all means to be considered as an indication for this procedure. In conclusion, I will relate, as a last expedient, what Ziegenspeck did in a case in which neither Schatz's nor the second method of Baudelocque accomplished the desired end: he employed the first method of Baudelocque, while an assistant at the same time undertook to push the child aside from without, according to Schatz's proposal; by this combined procedure he succeeded finally, with a great deal of force, in bringing down the head.

CHAPTER VII.

Reduction in Size of the Child by Obstetric Operations.

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Historical.—This operation was known to the most ancient obstetricians and practiced by them very often, especially perforation and embryotomy. Cephalotripsy, however, was first devised in the nineteenth century. Hippocrates described three instruments for embryotomy: a curved knife for opening the head, thorax and abdomen; a kind of bone forceps (*πνέστρον*) for breaking the cranial bones, and a hook (*ἕλκυστηρ*) for extracting the child.

Celsus explained decapitation and subsequent extraction, and Tertullian, one of the Christian Fathers (A.D. 218), described all the methods of perforation and dismemberment among the ancients, together with the instruments necessary for the operation. In the middle of the last century there were two obstetricians who made the most extensive use of mutilation of the child's body; one of these, Joh. Andreas Deisch, as E. v. Siebold said, had his field of murderous activity in Augsburg, and in 1753 made use of cutting instruments in 29 out of 69 deliveries. The other was Daniel Mittelhäuser, a physician of Weissenfels in Saxony (1721–1754), who lost only two(!) of every ten women that he confined, as he proudly boasted.

The only obstetrician who was opposed to perforation of the head was F. B. Osiander; he always brought the head through by means of his forcible forceps operation; of course, the cranium was often crushed.

Perforation of the Fœtal Skull.

The object of opening the child's head for the removal of the brain is to permit the delivery to be completed through the natural passages, where, otherwise, the unmutilated head of a fully-developed or viable child could not pass through the mother's pelvis.

Three indications for the operation may be enumerated:—

1. In the case of a *dead child*, if the extraction of the head undiminished in size would endanger the safety of the mother.

2. In the case of a *child whose life is much endangered* and whose chances of being saved are improbable, in order to protect the mother, as far as possible, from the dangers of a more difficult operation.

3. In the case of a *living child*, if a relative indication for the Cæsarean section exists, that is, if the child cannot be delivered through the pelvis as it is, and the mother firmly refuses the operation.

The question, Ought craniotomy to be performed on a living child? has stirred the consciences of physicians even to the most recent times, as the above literature plainly shows.

The percentage of maternal deaths in the hands of skillful operators is reckoned as 0 after perforation and as at least 8.4 per cent. after the Cæsarean section. The former is entirely free from danger, and the latter, especially in the hands of an inexperienced man, only can be designated as quite dangerous; therefore, perforation of the living child will be considered justifiable in many cases.

No one will hesitate, if he has to choose between sacrificing one being in order to save another or letting both of them die, to choose the former. It follows, therefore, that the advice of some obstetricians that one should wait until the child in utero is dead, is not only untenable, but is to the highest degree dangerous for the mother.

Besides the indications which are here enumerated, one condition must be mentioned: the pelvis must at least permit the passage of the child which has been diminished in size. Thus, the conjugate diameter of a symmetrically contracted pelvis must measure at least 6.6 cm., in flat pelves not less than 5.5 cm. The risks of perforation and the Cæsarean section should be conscientiously placed before the mother, and a living child should not be perforated without her consent.

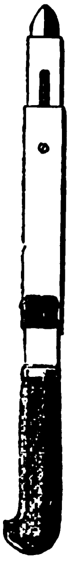
Instruments for the Operation.

There are various kinds of perforators in the form of scissors, knives, drills and trephines. Of these, most obstetricians use only the scissors and trephines.

1. The *perforating scissors* of Smellie, Bing, Walbaum, Nägele and others are about 30 cm. long, as a rule with their cutting edge on the outside and with sharp points; the prominences on the outer edges are entirely superfluous; the edges should not be too sharp and their cutting surface should be about 4 cm. long. A pelvic curve, not too pronounced, is advisable. If the scissors are very sharp, they can be forced through the cranial bones, otherwise only through the sutures and fontanelles; in the latter event they cannot be employed except where these are within reach. An expert can find these almost always, and therefore the scissors alone are all sufficient.

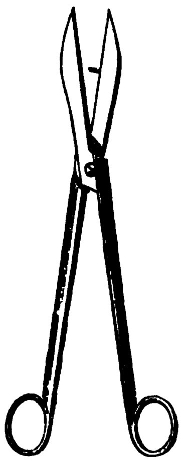
2. The *trephine perforators*—known for the past 100 years—of Wesscheck-Martin or Kiwisch-Leisnig and Guyon are 40 cm. long and consist of a metal trephining crown with a projecting pyramid or point, which are completely covered with a metal cylinder and can be so fastened in the latter that the crown is not exposed during the introduction of the instrument, and the genitals are thus protected from injury The shaft of the crown is attached to a wooden handle, which is fastened by means of a screw adjustment, and can be separated from it for the purpose of cleaning the instrument. Both of these perforators are used by the Germans, English and Russians, while the French more frequently employ one in the form of a knife—a double cephalotome (see Cazeaux, page 896).

FIG. 142.



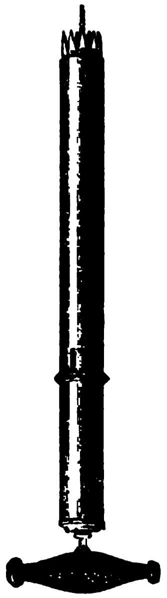
Knife-shaped perforator.

FIG. 143.



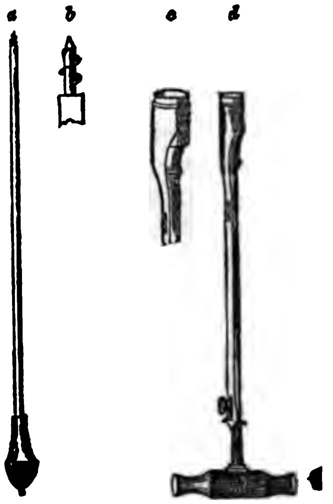
Perforating scissors.

FIG. 144.



Trephine perforator (Leisnig-Kiwisch).

FIG. 145.



Guyon's Trephine (see Auvard).

Guyon (Fig. 145, *a*, *b*, *c*, *d*) bores a turrel (a cooper's tool) into the vault of the cranium and trephines with the crown of the instrument set over this. Through this opening he bores into the base of the skull and trephines this with the smaller crown.

Perforation *per se*, like version, is merely a preparatory operation, in no sense is it necessarily associated with extraction. If the child is dead, it is understood that it must be removed as quickly as possible, since decomposition may set in, and the mother's life thereby be compromised.

Performance of the Operation.

Since the operation, in itself, is not painful, it is not essential to use anæsthesia; but it is preferable, since it is often necessary to introduce the half or the whole hand into the genitals, whereby much pain is caused in primiparæ, and, further, since the sad impressions and anxiety of the parturient are relieved.

The operation is best performed in the cross-bed position. The bladder and rectum must of course be emptied, and the vagina and uterus disinfected. An assistant grasps the head from without just above the symphysis and fixes it, so that it does not slip—an accident which very often happens in the use of the trephine, even though the presenting part is firmly wedged in.

If a fontanelle or a suture is within reach, I always have a decided preference for the scissors, because their application is easier, simpler and safer, and the laceration of the cranium can be made sufficiently large to allow of the thorough escape of the brain.

If a suture is not to be felt, and if the cranial bones are very hard, then I choose a trephine. The introduction of the instrument is performed as follows: Two fingers of the left hand are placed against that part of the skull through which the perforator is to be forced, and the point of the selected instrument is firmly pressed against this spot.

The scissors are thrust through this, and the opening is enlarged by the separation of the blades; they are then pushed through the brain to the base of the skull, and the brain substance is broken up in all directions, so that it can easily flow through the opening.

The metal cylinder of the trephine is first placed firmly and squarely against the portion of the scalp which is to be perforated, the crown with its pyramid is then loosened and very slowly screwed into the scalp and through the bones. It is necessary to press equally in all directions, otherwise the instrument will slip, and the act of trephining be more difficult and wearisome than one would *a priori* imagine. The rotation should be stopped as soon as the absence of resistance shows that the skull has been perforated, then the crown of the trephine is to be withdrawn into its cylinder, and the instrument removed.

As soon as a satisfactory opening has been made by one or the other of these methods, a douche nozzle is to be introduced through it and a 3-per-cent. carbolic acid solution or a 1-per-cent. creolin solution injected, so as to cause the brain tissue to escape. This is repeated five or six times, and similar vaginal douches, in case the extraction of the child does not follow immediately, are given from time to time to prevent the brain from remaining there and decomposing.

In the case of the *after-coming head*, the breech of the child should be drawn to the left side, by an assistant, above the thigh of the mother, who should be on the back. The operator passes half of the left hand to the base of the skull, and examines the region about the ear, until he finds one of the lateral posterior fontanelles; this he then perforates with the scissors. Even unskilled operators can thus perform the perforation every time on the manikin with the head high up. The proposition of Cohnstein, to remove four to six arches of the dorsal and cervical vertebræ, then to draw down the dura mater and medulla row as far as possible with a pair of dressing forceps, and remove the brain through the open canal, can always be attempted, in case every other mode of operation should prove unsuccessful.

Prognosis in Cases of Perforation.

In itself, perforation is neither painful nor dangerous for the mother. It is often made so by performing extraction immediately afterward, whereby lacerations of the mother cannot always be avoided; or the circumstances which rendered perforation necessary, as bruises and commencing sloughs, had already produced a condition dangerous enough to kill the mother, so that the unfavorable result could not be attributed to perforation. Since 1836 my father, in his private practice, has perforated over fifty times in rachitic and osteomalacic cases, and only lost one puerpera. He almost always extracted the child at once. The prolonged retention in utero of the dead child, to which the air has had access, is certainly objectionable, inasmuch as its decomposition is hastened, for it is very difficult to prevent the entrance of air into the uterus during the operation.

Hence it follows, as a rule, that perforation of dead children should not be done too early, and extraction should follow it as soon as possible.

Robert Lee lost only four out of 80 puerperæ after perforation, 5 per cent. Leopold ("Der Kaiserschnitt und seine Stellung zur künstlichen Frühgeburt, u. s. w.," Leipzig, 1888, S. 112) places the mortality of perforation at 0 per cent. He lost 2 out of 71 mothers, not as a result of the operation, but from eclampsia. But if this author figures the mortality after this operation for Spiegelberg at 15.5 per cent.; F. Winckel, 14.6 per cent.; Gusserow, 14.3 per cent.; Olshausen, 12.5 per cent.; P. Müller, 11.8 per cent. and Credé, 8 per cent.—it does not suffice, in drawing one's conclusions from these figures, to say merely that these operations were done by most authors altogether or mainly before the time of antisepsis; but the following fact is worthy of much more consideration:—

Credé	had in	5,540	labors	98	craniotomies	= 1.77	per cent.
Leopold	"	5,510	"	71	"	= 1.29	"
	(37 on dead, 34 on living children.)						
Olshausen	"	7,141	labors	80	craniotomies	= 1.18	"
Gusserow	"	15,093	"	167	"	= 1.1	"
The author	"	12,117	"	48	"	= 0.39	"

Credé, therefore, operated four times as often as I did, Leopold and Olshausen more than three times, and Gusserow nearly three times. There is no doubt, then, and the above statistics prove satisfactorily, that the more frequently the indication presents, so much the more favorable must the results be for the mother, since the number of easy cases always gains the ascendancy. Here in Munich I am equally strict with my indications as formerly, and so there were only 16 craniotomies in 3500 births, or 0.45 per cent., of which 2 died of peritonitis, that is, 12.5 per cent., of course not from the operation, but as a result of the lesions and infection during the labor. In the first case infection was effected before the operation in a parturient whose pelvis was obliquely contracted and the lower uterine segment greatly thinned. In the other the perforation was performed on account of the sudden occurrence of rupture of the uterus—an injury that is almost certainly fatal; it was done so as not to let the woman die undelivered. These must, of course, be excluded; there remains then but one fatal case out of 15 perforations, including cranioclasis, or 6.6 per cent., a figure which, excepting that of Leopold, is smaller than that of all of the above-mentioned authors. In conclusion, I wish to emphasize the fact, that the operation that immediately follows the perforation, whether it be extraction with the cranioclast, Mesnard's forceps, or the cephalotribe, must be taken into consideration in estimating the results for the mother. Thorn has already called attention to this circumstance; he found that of 80 craniotomies 60 were done on children that were proved to be dead (Halle), while in Leipzig, of 100 craniotomies, 64 living children, and in Dresden 34 out of 71, were perforated. My experience agrees with Thorn's figures.

CHAPTER VIII.

The Comminution of the Bones of the Fœtal Skull—Cephalotripsy. Basiotripsy. Basilysis.

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Historical.—Though Assalini, Aitken, Lauverjat, Osiander and others have used instruments by which the fœtal skull was screwed fast and so compressed that even fractures were produced, yet this effect was not the primary purpose of those instruments; they were intended only to grasp the head. The nephew of Baudelocque first described, in 1829, in a memoir presented to the Royal Institute of France, an instrument, the direct object of which was to break up the head. Baudelocque wished this to take the place of the cranial perforator and the sharp hook, and operated with success in his first case before Desormeaux and Dubois. In spite of this, the instrument found many opponents; Froriep, Osiander, Sr., v. Jörg, Schwarzer, Grenser, v. Siebold and Rosshirt expressed themselves against it on account of the danger associated with it. Jörg held that compression of one oblique diameter increased the other, and, since the compression was usually made in the transverse diameter of the pelvis, the obstruction would be increased for the conjugate. On the other hand, v. Ritgen, Busch, Kilian, and especially K. Chr. Hueter were in favor of the operation. The latter, in his article: "Die Embryothlasis," Marburg, 1844, received much credit for accurately establishing the indications for the operation, as well as its mode of performance.

Since then it slowly gained adherents everywhere, and was considered a useful, and in many cases, a blessed operation.

The most complete work on cephalotripsy, with pictures of the various instruments devised from 1829 to 1862, was written by J. F. Ed. Lauth: "De l'embryothlasie et en particulier de la cephalotripsie," Strasbourg, 1863.

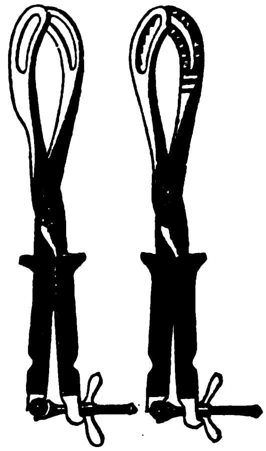
At about the same time S. Y. Simpson's publication of his cranioclast appeared, and an improved form of Mesnard's cranial forceps was introduced and recommended by me (1861). As a result the conviction has been growing stronger during the past fifteen years that cephalotripsy can be dispensed with, and even more: that it can be entirely superseded by the use of the cranioclast, particularly of the cranial forceps. In 1877, at the gynæcological congress in Munich, this view was expressed by Spiegelberg and myself, and since then has received more and more appreciation, so that already many authors, as C. v. Braun, the author, and others, no longer make use of the cephalotribe.

Description of the Instrument.

The cephalotriptor or cephalothryptor, *cephalotribe*, cephaloclast, is a fenestrated or non-fenestrated pair of forceps, which has a compression apparatus on the handles, by means of which the ends can be brought together with great force. Thereby the part which is between the blades is sufficiently crushed. The blades are heavy and have a moderate pelvic curve of about 3 cm. For a long time the point was discussed, whether the instrument should have such a curve. I am of the opinion that it should be bent somewhat on its edge, that it is better to have this curve too slight than too great, since the former defect can be rectified by the direction of the traction, while the latter cannot. In order that the handles may be brought together in spite of very great resistance, the lock is a very firm one, and its components are wide and moderately thick. The handles are longer than those of the ordinary forceps, so that the requisite amount of power for approximating the blades is reduced to a minimum for the physician. These and the entire instrument, however, have been made gradually shorter and lighter, with reference to the fact that the weight must not be too great. Besides the fenestration, the inner surfaces of the blades have been made serrated, so that they may grasp the head more securely (see Figs. 146 and 147).

There are various forms of the compression apparatus. Cohen's (Figs. 146 and 147) is the simplest and easiest to manipulate. One end of the transverse screw fits into an opening in a knob placed at the lower end of the left handle, and when inserted therein can be turned about a pivot at a right angle downward. The right handle has two flat plates one above another, the outer surfaces of which contain two small projections; between these plates the free end of the screw is inserted and a thumb-screw with double lever is easily brought down against the right handle. The two projections prevent the slipping downward of the screw and of the nut off the metallic plates. Although I use the English lock in the ordinary forceps, for the cephalotribe I give the preference to that of Busch or Nägele-Brünninghausen, since the first is so hard to close at times that the hand becomes very weary. This does not happen with the forceps if the blades have been properly adjusted, while with the cephalotribe it is sometimes unavoidable.

Fig. 146. Fig. 147.



Cephalotribe.
1. Breisky.
2. Breisky-Jakesch.

All cutting, sawing, or hook-shaped attachments in or upon the inner surface of the blades, are to be rejected; they are dangerous, because the mother is liable to be injured with them and the attachments readily break off. The instruments of Cohen (double knife), van Huevel (forceps with serrated teeth), and Hennig (extraction hooks) are, therefore, superfluous and have scarcely any advocates.

The cephalotribe must not be too light, nor yet too heavy. A weight of 1½ kgm. with the screw and all of the attachments is just right.

A. R. Simpson's *basilyst* is a perforator in the form of a screw, which is bored through the vault and into the base of the skull, and there fractures the bones into which it has been inserted, by means of a screw passing through the two dilating parts of the instrument.

The *basiotribe* of Tarnier is used for perforating and at the same time breaking up the base of the skull.

The Performance of the Operation.

Cephalotripsy is not to be resorted to, unless the following *conditions* are fulfilled:—

1. The os must be dilated at least to the width of the breadth of the blade of the cephalotribe, otherwise the instrument cannot be introduced and locked without lacerating the cervix. In multiparæ a dilatation of 4–5 cm. suffices.

2. The pelvis must at least be so wide that the mutilated child can be safely brought through.

3. The position of the head must be such that the ends of the blades can be brought over the base of the skull, otherwise the instrument will slip off and the head will not be sufficiently crushed, because the vault of the skull will remain intact. It may, however, be high up and movable, yet it must be possible to grasp it securely.

Under these conditions cephalotripsy is *indicated:—*

1. In the case of a dead child, if the extraction of the head, undiminished in size, would be dangerous for the mother, or if the head does not engage because of some relative disproportion.

2. In the case of a living child, if a relative indication for the Cæsarean section exists and the mother does not give her consent, or if the pelvis is not so greatly contracted that even the induction of premature labor would be contra-indicated in a subsequent pregnancy.

Perforation and cephalotripsy have the same indications but require different conditions and, therefore, find different fields of application.

The *object of cephalotripsy* is to diminish the size of the head; the obstruction is thus overcome, which prevents its expulsion. As soon as this is done the operation is completed and the instrument can be removed. Since, however, in very many cases the mother's life has been endangered by previous attempts at operation or the compression of the soft parts, it has been customary to proceed with the extraction immediately after the operation, and to employ the cephalotribe for the extracting instrument.

This practice is not commendable since we possess a much better and safer extraction-instrument than the cephalotribe in the cranioclast. Cephalotripsy, whenever it is still resorted to, should be solely a preparatory operation for overcoming the obstruction by diminishing a head that is too large, but under no circumstances should it be used for delivery.

Operation.—The operation is done in the cross-bed position, or in the left lateral prone position. I have repeatedly used the latter with advantage. Of course, the woman is anæsthetized, the bladder and rectum are emptied previously, and the vagina is washed out.

The introduction of the blades is the same as in the forceps operation. The half or whole hand is introduced as high up as possible, to examine the course which the instrument must take. It is a matter of no importance in which diameter we first seize the head; if, after introduction, the blades lock in the transverse diameter of the pelvis, we may apply the compression in this. As soon as this is done, the lock is unfastened and the blades by rotation brought into one of the oblique diameters which is compressed, and, finally, the other oblique diameter is treated in the same way.

During this time an assistant must fix the head with his hands over the symphysis, to prevent its slipping during the application of the blades. It very often happens that, after having once compressed the head, the instrument slips back again and we make compression a second time over the same place. The rotation of the blades of the instrument, as well as the locking of them, must be performed very cautiously, for we hold in the hand a heavy instrument with a long handle (or lever), that may easily damage the parts. A very important bit of advice is to press the handles as far as possible against the perineum when locking them. If we wish to secure firmly a proper segment of the head, which usually stands pretty high, we must proceed in this manner; if we seize it too short, it will slip out above the blades during the compression.

The compression should be performed slowly, the head will then be safely splintered without any spicula of bone projecting through the scalp. Frequently the cracking of the bones is plainly heard.

Lauth found, as a result of the use of the instrument, that a destruction of the base of the skull occurred in 10 out of 22 accurately described cases, and in only one-third of the cases all the bones of the skull were broken.

Prognosis.—Of 192 cases collected by Lauth, which permit us to compare cephalotripsy with extraction, 50 (!) women died = 26 per cent., 8 suffered from fistula, 75 recovered after a severe convalescence, and only 40 = 20.8 per cent., made an easy recovery. It is evident, therefore, that this result must not be attributed to cephalotripsy alone, but the extraction must be considered in connection with it. This unfavorable issue is partly explained by the condition of the patient before commencing the operation (bruising of the uterus, etc.), but certainly not entirely.

In conclusion, I would remark once again, that the cephalotribe is an instrument which can be dispensed with, and the time is not far distant when it will no longer be used. My assistants and I, in the past fifteen years, in about 15,000 deliveries, have done without it, and the scanty publications about this operation in Germany show further that its use is steadily decreasing.

CHAPTER IX.

The Separation of the Fœtal Head from the Body—Decapitation.

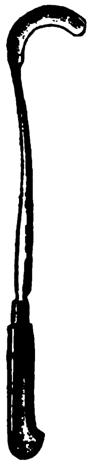
LITERATURE.

Arnott, J.: Tr. M. and Phys. Soc., Bombay, 1885, N. S., No. VII, 31. Belluzzi, C.: *Mem. de Accad. d. sc. d. Ist. di Bologna*, 1886, 4, s. VII. Brydon, W.: "Complicated Case of Labor—Spontaneous Decapitation," *Brit. Med. Journ.*, London, 1886, II, 64. Doléris: *Bull. et mém. Soc. obstetr. et gynéc. de Paris* (1885), 1886, I, 1–5. Frascani: "Di un nuovo processo dei decollazione fetale et di un nuovo strumento per eseguirla," *Ann. di ostetr.*, Milano, 1886, VIII, 37–55. Piskacek, L.: *Med. News*, Phila., 1886, XLIX, 208. Verrier: *Bull. et mém. Soc. obstetr. et gynéc. de Paris* (1885), 1886, I, 210.

Celsus has accurately described decapitation; still it was rarely used in ancient times; the arms and legs were removed, and eventration performed by preference.

Decapitation is *indicated* in the case of a child of more than seven months in a neglected transverse position, where dangerous distention of the lower uterine segment, and a tetanically contracted uterus are present, and, possibly, in the case of double monstrosities. The *conditions* are, that the pelvis should have a conjugate of at least 5.5 cm., and the cervix be sufficiently dilated for the introduction of the hand and instruments, and at least 5–8 cm. wide.

FIG. 148.



Sickle-shaped knife for decapitation. *After B. S. Schultze.*

The use of chloroform is necessary, and the dorsal or the cross-bed position are most to be recommended.

The *operation* is most frequently done according to C. Braun's method, and with his hook or with the sickle-shaped knife of B. F. Schultze. The former is an instrument 30 cm. long, having a strong wooden handle attached to its lower end, and the point of which is sharply bent into a blunt hook 4–5 cm. long. In order to apply it, the neck of the child must be drawn down as deeply as possible by means of the presenting arm, the index and middle fingers of the left hand should then be introduced from before backward over the neck, and the hook passed underneath and in contact with the latter and in the same direction. As soon as the hook has seized the vertebræ securely, it should be twisted about on its long axis. Care is necessary not to turn it too rapidly, otherwise it easily flies back and slips out, causing lacerations of the soft parts. It should always be turned in the same direction and with force, until the spine fractures with a cracking sound, and the hook then twisted through the remainder of the soft parts, or they may be cut through against the hook with a pair of scissors. Thus neck and body are to be separated completely from each other. The sickle-shaped knife of Schultze is introduced just like the blunt hook; after grasping the neck it is severed by a sawing-cutting motion of the instrument (see Fig. 148).

Decapitation can also be done with the chain saw, or with a pair of strong, blunt-pointed navel scissors, or with Dubois' scissors, or with an instrument shaped like scissors and resembling Braun's cranioclast, such as Frascani proposed. We may also introduce a strong silk sling around the child's neck and then cut down on this with an ordinary scalpel. Furthermore, a whip-lash with sawing motions (*Pajot*), or Meadows' wire écraseur, after Kesmarsky, may be employed.

The results of decapitation are scarcely to be called favorable, even if we bear in mind that the cases are generally protracted transverse positions with manifold complications, especially deformed pelves and large children. Of 31 such cases 5 women perished, = 17 per cent.; by no means as a result of the operation alone, for several of them died from the lacerations which they had received during the operations that were attempted before the decapitation (compare Kueneke: *Monatsschrift für Geburtskunde*, xxv, 375).

CHAPTER X.

The Removal of the Thoracic and Abdominal Viscera of the Child—Evisceration.

LITERATURE.

Doléris: *Journal des conn. méd. prat.*, Paris, 1882, 3, s. IV, 402, 409, and *Ann. de gynéc.*, Paris, 1885, XXIII, 167. Depierris, J. G. A.: "Essai sur l'embryotomie dans les présentations du tronc, etc.," Paris, 1883, No. 164. Cordes, A.: "Un cas de décollation avec le crochet-mousse armé de la ficelle," *Ann. de gynéc.*, Paris, 1885, XXIII, 279. Frascani, V.: "Contributo allo studio dell' embriotomia ed analisi delle condizione che la neces sitano nelle presentazione laterali," Pisa, 1887. Guzzoni degli Ancarani, A.: "Embriotomia nelle presentazioni di spalla ed uncino rachiotomo," *Rassegna med.*, Modena, 1887, II, 58. Inverardi, G.: "Ventidue casi di embryotomia," *Osservatore*, Torino, 1884, XX, 657, 673, 689, 705. Simpson: "A Lecture on the History of Embryulcia," Tr. Edinb. Obs. Soc., IX, 1178, 1230, 1883-84. Tabournel, C.: "Considérations sur les diverses méthodes d'embryotomie; décollation avec la ficelle" (*Pajot*), Paris, 1885.

In some few cases it is impossible, even under anæsthesia, to reach the neck of the child, because the tetanic contractions of the uterus prevent it, or because it lies so high above the os cervicis and the body is jammed down into the latter. Eventration may also be called for in marked enlargement of individual organs of the child, *e.g.*, in cystic kidneys and in enormous distention of the bladder. In such cases nothing is left but to make an opening through the presenting side, so as to perform evisceration of the thorax and abdomen through it. Formerly, perforators in the form of scissors were used for this. Robert Lee, Veit, Ed. Martin and Weber successfully employed the trephine, and claims as advantages for it, first, the greater circumference of the opening, which can easily be enlarged, and through which the contents of the thorax and abdomen can be rapidly removed, and, second, the smooth condition of the edge of the wound.

The trephine is applied as follows: Two fingers of the left hand are placed upon that part of the fœtal thorax which lies in the cervix and is to be perforated, the instrument is introduced and pressed firmly upon it, when the crown is unscrewed and bored slowly through the thorax. The scissors answer the purpose exactly as well. It is scarcely necessary to have an assistant fix the uterus from without, as the fœtal part is so firmly wedged in. After the removal of the instrument, two fingers are passed through the opening and the various organs extracted. Enough room will be secured thereby to grasp the feet with the hand and to perform version and extraction. If this is not the case, two fingers should be passed into the thorax, over the vertebræ, on which strong traction is made so as to bring down the breech; the further extraction will then offer no especial difficulties. Many times it is sufficient, even without opening the abdomen, to hook two fingers into the small pelvis of the child with very considerable pressure, or through an opening in the abdominal wall to hook them over the vertebræ, and thus draw down the breech; in this way, without the removal of the abdominal contents, we imitate the process of natural version.

CHAPTER XI.

Reposition of Prolapsed Extremities.

LITERATURE (see p. 380).

The reposition of a prolapsed extremity was performed by Rueff, Peu, Mme. Siegemund and Deventer, and with justice was warmly advocated by them; some authors, as de la Motte, Levret, Ritgen and Arnett, expressed themselves almost decidedly against it. The earlier among these writers feared that the vagina would be lacerated by it (*Levret*); the later authors, that the head would be brought into some faulty position, and the labor thereby be made much more difficult.

The object of the operation is to overcome the obstruction to the engagement and advancement of the head. It is, therefore, indicated as soon as we perceive that retardation of labor is actually caused by the extremity. We recognize that this is the case, in part by the position of the head in relation to the pelvis and by its changes of position during the pains, and in part by the swelling and constriction of the arm and of the maternal soft parts. We cannot always wait until the obstruction is very evident, but in many cases we shall be obliged to operate before this happens, for example, in cases of slightly contracted pelves, of large children, of prolapse of an extremity at the anterior pelvic wall, where we can anticipate with some degree of certainty the occurrence of delay and the dangerous results of an impacted arm. Since, however, the reposition of prolapsed extremities is only preparatory to the delivery and does not hasten it, it is superfluous, or at least not indicated, in those cases in which the most rapid delivery possible is called for, because of some danger to the life of the mother or child. Such is the case when the heart-sounds of the child have fallen very much, or severe hemorrhage from the genitals has occurred, or a serious swelling of the soft parts is already present. It is more dangerous when the head is firmly engaged than when it is freely movable. It cannot be performed if the head, at the time, is so very low down that the introduction of the hand is very difficult and hazardous for the parturient.

For the same reasons the presence of a stricture or tetanus of the uterus would contra-indicate it. On the other hand I do not acknowledge that the prolapse of the cord alongside of the extremity is of itself a contra-indication to the reposition of the latter. If no other complication is present, if the pulsations of the cord are strong, and if the pelvis is not contracted, I would prefer under all circumstances to replace them both together, or first the cord and then the hand, because both the forceps operation and version in the case of prolapsed cord, unless the head has advanced very far, are extremely dangerous for the child, while the reposition of the cord is a comparatively easy operation, which is often crowned with success.

Preparation for and Performance of the Operation.

The parturient is to be placed on the side toward which the extremity has prolapsed, because the head thereby glides a little more to the side and gives us more room for our hand. Should even several extremities be prolapsed, the cross-bed position can be dispensed with, because we can introduce the hand corresponding to the side concerned just as well in front of as behind the head, along the anterior or posterior wall of the uterus. A change of hands in the reposition of several extremities, which Pernice considers the most natural procedure, is not necessary. For difficult cases the knee-elbow position has been recommended, in which, however, we must of course guard against the enterance of air into the uterus. The operation is completed only when the hand has been pushed entirely above the head and placed over the chest of the child; to do this it is generally necessary to introduce the whole hand. After chloroforming the patient, the hand or arm is grasped and passed alongside of the head, obliquely across the face toward the neck and chest of the child, and the forearm is pushed in front of the thorax toward the opposite side to prevent its prolapsing again. After this is accomplished, the operator removes his arm slowly, grasps the child's head and draws it down into the cervix and the small pelvis. Next he examines whether the head is in a favorable position, and if not, he effects it. Then he withdraws the hand and places the woman on the side opposite to which the head has deviated. The whole operation can be done while the membranes are still intact and without rupturing them; to do this the hand must not be seized too firmly, and in pushing it back must be at once released when the increasing distention of the membranes indicates the commencement of contractions.

It depends entirely on the kind and degree of the prolapse and the position of the hand, whether the operator passes in front of or behind the head, or obliquely across the face. In general he will push the extremity away from the short diameters, the antero-posterior and oblique, toward the longer ones, the transverse and oblique, so as to replace it with the least resistance. If a deviation of the head or an inclination on the part of the extremity to again prolapse should occur while the membranes are still intact, he ruptures them and brings the head down as low as possible.

The reposition of a prolapsed foot is done in the same manner as the hand; he passes along the leg to the knee, bends this and pushes the leg back above the head. This is unnecessary in small, poorly developed children, where the prolapse of a lower extremity frequently occurs.

Prognosis and Result of the Operation.

With due regard for the conditions that call for the operation it is but slightly dangerous and has scarcely any influence on the action of the pains. If it is done before the cervix is easily passable, it may cause a laceration there. Care is necessary in passing the hand up alongside of the head, lest a premature separation of the placenta be produced. In all of my cases both mother and child were saved.

CHAPTER XII.

The Reposition of the Prolapsed Cord—Omphaloproptosis, Apothesis Funiculi Umbilicalis.

LITERATURE—(See p. 366).

The replacement of a prolapsed cord is done to overcome a danger to the child, which would arise from compression of the funis in the cervix or in any part of the small pelvis. The object is to place the cord in a place where it is free from pressure and cannot again prolapse. This is accomplished only when the cervical canal and the os cervicis can be completely filled up after the reposition by some large part, without leaving room in it for the cord. Therefore, in incomplete or complete footling position, its replacement avails nothing; in these cases it suffices to push it merely to one side of the cervix or the small pelvis, where it is least endangered by pressure.

The reposition, then, is *indicated*—

1. In head presentations and prolapse of the cord after the rupture of the membranes, if the cervix is not sufficiently dilated to permit of the rapid completion of the delivery;
2. In head or face presentations and prolapsed cord with the membranes intact, if the pulsations of the cord diminish in frequency and become weaker;
3. In simple breech presentations, with an insufficiently dilated cervix;
4. In transverse positions during the first stage of labor (see also p. 379).

The *conditions* which are necessary for the operation are, (1) that the child be living. We must not let ourselves be misled into the conclusion that the child is dead, because the pulsations are no longer to be felt; but always listen to the fœtal heart-sounds as well, since it happened to me that a living child was born after the reposition of a pulseless cord. (2) The head of the child must not be so firmly engaged that we cannot pass by it, and (3) the cervix must be completely or almost fully dilated.

The reposition can be done either with the hand or with instruments. All of the more recent authors are agreed that the hand is always the best instrument and that repositors are seldom needed.

The preparation for the *manual reposition* consists of anæsthesia in primiparæ with narrow sensitive genitalia, the choice of a suitable position and the removal of the urine by a catheter. In multiparæ with wide genitals, the use of chloroform is unnecessary. The position is chosen according to circumstances. If the cord has slipped down on one side of the pelvis, we place the patient on this side, push the cord far back with the corresponding hand (the right one for the left side of the mother), withdraw the hand slowly from the uterus, and while doing so, grasp the head and pull it down somewhat lower. The woman should then be slowly turned to the opposite side, whereby the head is lifted to one side, and the uterine wall is pressed upon more closely where the cord was originally prolapsed.

The reposition can be done just as well in the cross-bed position, and I have once performed it rapidly in the ordinary dorsal position, without any special difficulty, in a multipara with wide genitals and a not very marked inclination of the pelvis. Here, as in version, the hand and forearm must be well oiled, and care taken in passing through the vulva, and especially the cervix, because here the cord suffers most readily a dangerous pressure from our hand. If the membranes have not yet broken, the cord must be seized through them, between the pains, and pushed past the presenting part. If a pain occurs, we release it, and let the hand remain quiescent, to avoid rupturing the membranes. In head presentations, it must be pushed over the chin, or, at least, on to the neck. If this is successful, we can remove the hand only when we feel that the cord does not slip down with it. In order to prevent the slipping down again of the cord, Finke has proposed that the hand be brought horizontally forward about a quarter of a circle, and then withdrawn directly from the uterus. In many cases this is unnecessary, because we recognize at once that the cord remains in the hollow where we placed it. Some authors, as Wegsscheider, believe that the reposition is generally useless before the escape of the liquor amnii; that under some circumstances it is even injurious. This error manifestly is based upon the untenable supposition that the cord can experience no dangerous compression within the unruptured membranes. I can assert positively as do many others, *e. g.*, B. Massmann, that the cord can be reposited without injury to the membranes, even many times in the same patient, because I have frequently done it with good success. Should the operation be unsuccessful, while the membranes are intact, and if the heart-sounds have fallen, the membranes should be ruptured and the reposition attempted again. In such cases the cord must be grasped between two fingers and must undergo a certain amount of pressure, which is, as a rule, not dangerous.

The answer to the question, whither and how high shall the cord be pushed back, is: so high that it is no longer subjected to pressure between the uterine wall and the presenting part. It therefore suffices to push it above the chin or in front of the chest into the hollow which is formed here between the upper extremities and the thorax. Various obstetricians, B. Croft, Velpeau and Stoltz, have not been satisfied with this, but have carried it still higher, so as to throw it around a leg or knee of the child. Though in general, this practice is unnecessary, it can be productive of good results in the case of repeated slipping down of a cord which is too long and heavy or inserted too near the cervix, because such a loop shortens the navel-string somewhat and holds it absolutely fast. Wigand ("Geburt des Menschen," 1820, Bd. II, 404) taught that the cord should not be brought to one side of the pelvis, but preferably forward toward and above the os pubis, because in the normal position of the head there is less room for its prolapsing again and this place is the quietest part of the uterus. For women with very pendulous abdomen this advice is suitable, for others it is less so. Michaelis appropriately remarked that the manual reposition caused, at the same time, a firm compression of the cervix around the presenting part by mechanical irritation; that this is, indeed, an important prophylactic against another prolapse.

The knee-elbow position, as we have already seen, has been recommended by many authors; first by Deventer, then by Ritgen, Kiestra, Thomas, Theopold, Dyce and K. Schröder. Schröder thought that the lateral position was of little value and should only be used in the event of the former failing. I would merely remark that I have never used the knee-chest position and as yet have never failed.

If the cervix is not sufficiently dilated, but admits only one finger, and we perceive that the pulsations of the cord are becoming slower, nothing remains but to *reposit the cord with instruments* so soon as the membranes are ruptured. The oldest instrument devised for this operation, and one which is still much used in England and France, is that of Dudan (1826). It is a long, large elastic catheter, whose stilette holds a noose in the upper side opening; this is passed around the prolapsed part of the cord and slips out of the opening as soon as the stilette is withdrawn.

Since then a large number of similar instruments have been invented and recommended, of which only a few have received any general recognition. Schöller's omphalosoter consists of two whalebone rods, which are somewhat separated from each other near their ends, where one of them is hollowed out for the reception of the cord; they are in contact again at their points. The excavated rod is advanced a little and the selected part of the cord laid in its hollow; to close the latter the other rod is pushed up; by this means the cord is inclosed in a large opening and can be carried up as high as desired and to any part of the uterus. The inclosed cord becomes free by pushing forward the first of these two rods by a small projection on it, and the instrument can then be withdrawn by slowly turning it, without bringing the cord along with it.

Simpler than this is the navel-string repositor of Carl v. Braun, called apotheter; it has a round gutta-percha staff, 45 cm. long, below 1 cm., above ½ cm. thick, which has an oval opening about 1.5 cm. from each end. Through the upper one the loop of a sling (which is best made out of a narrow silk ribbon) is passed, and between it and the end of the staff the funis is so placed that it is fixed against the surface of the rod by means of the sling, which is pushed over its points. When this is done, it is passed well into the uterus and the loop of the sling is worked off the staff by twisting and drawing it back; the cord is thus set free. Then the instrument is withdrawn during a pain. Carl v. Braun has used this instrument exclusively in the Vienna Hospital, and with good results. In the same manner, a new elastic catheter with a stilette and a short piece of silk ribbon can be used for a repositor.

If the cord falls down every time after it has been reposited, the instrument can be introduced and left with the loop in the uterus; thereby the cord is certainly retained in place, and the activity of the pains increased and the delivery hastened.

The remaining instruments, as that of Tellegen, the omphalotacterium of Neugebauer, besides the repositors of Varges, Martin, Roberton, Simon Thomas and others, have no advantages over those which have been mentioned. Ashford attached a prolapsed cord to a Gariel pessary, pushed this up and inflated it to prevent the cord from coming down again; the resul was good (*Lusk, l. c.*, page 626).

If the cord is prolapsed in a face presentation, the reposition must likewise be performed according to the above directions. I cannot agree with Schröder when he recommends version instead of reposition. In case the pelvis is but slightly if at all contracted, I would much rather push up the face and force the occiput down from without, while withdrawing the hand, provided there was no indication calling for the rapid completion of the labor, since the whole hand anyhow would have to be passed into the uterus; that is, I would seek to convert it artificially into a vertex presentation—a practice which is by all means less dangerous and more fruitful of good results for the mother and child than version.

If a cord should prolapse in a breech presentation, the reposition can be carried as far as the middle of the abdomen, if at least one knee lies in front of the abdomen. If the cervix is still very narrow, it can be performed with an instrument. If both feet are down there is nothing in front of the child's abdomen to hold it up. It is better to delay the reposition in complete footling presentations, because the cord does not easily become subjected to dangerous pressure. It is taken for granted that, after the successful reposition of the cord, the heart sounds must be carefully watched, and the condition of the escaping liquor amnii must be examined.

SECTION III.

Operations Performed During Delivery.

(1) The propulsion of the child, undiminished in size, through the natural passages.

CHAPTER I.

Expression of the Child—Expressio fœtus.

LITERATURE.

Abegg: "Zur Geburtsh. und Gynäk.," Berlin, 1868, p. 32. Bidder: *Zeitschrift für Geburtsh. und Gynäk.*, II, 267; III, 241. Breisky: *Correspondenzblatt für Schweiz. Aertze*, 1875, Nr. 5. Kristeller: *Berliner klin. Wochenschrift*, 1867, Nr. 6. *Monatsschrift für Geburtskunde*, XXIX, 237. Playfair: *Lancet*, 1870, II, 465. Ploss: *Zeitschr. f. Med. Chir. und Geburtsh.*, 1867, S. 156. De Vrij: "Over de uitdryving der Vrucht," Utrecht, 1870.

Some years after the method of the expression of the placenta, which was proposed by Credé, had been generally introduced into the German hospitals, Kristeller recommended the expression of the fœtus in a manner similar to it. The suggestion was new only in this, that pressure on the child should be made use of for propelling it, while the entire child was still in the genital canal. For the expression of the body after the head was born, and of the after-coming head from the fundus uteri, had been practiced for a long time and was generally known.

The object of expression of the fœtus is, in part, to hasten the delivery of the child by increasing the vis a tergo, by thus stimulating the uterine contractions and the abdominal pressure, and, in part, to directly express the child in a manner which corresponds to its position and presentation, and when necessary, to displace, at the same time, the uterus to one side or more upward and backward, or rotate it about its long axis.

The *conditions* requisite in the performance of this operation are, respectively, that the abdominal wall be not too fat or too sensitive, that there be no inflammatory condition of the abdominal organs, especially of the uterus and genitalia, that there be no large tumors in the former, and finally, on the part of the pelvis, that no marked disproportion between the fœtal head and the bony canal be present. In other words, all the conditions for version by external manipulation suffice also for the expression of the fœtus, except that the latter is done only in longitudinal positions, and in the largest proportion of cases, in vertex presentations.

Of course there must be no reason for the rapid delivery of the child; in the latter event, the expression could only be used to assist extraction.

The expression of the fœtus is *indicated* in faulty uterine contractions at the end of the first stage, to fix the head better over the cervix, for example, in placenta prævia, in cases of a pendulous abdomen, in the delivery of the second twin, and after external cephalic version; further, in defective abdominal pressure at the close of the second stage, when the external genitals are not too tense and narrow, and the head has been well down for a long time, and especially if the mèconium has been discharged without the heart's sounds being diminished in frequency or strength; particularly, also, in small children not fully developed, and in very large ones if the patient's strength is giving out. Its application is most frequent among primipara, and especially the older ones, in whom the soft parts are more rigid; by this method the delivery is managed much better than if it were terminated with instruments.

Performance of the Operation.—In expression of the fœtus, which begins at the close of the first stage, the parturient is placed on the back close to the edge of the bed; the operator stands on her right side and grasps the fundus uteri with both hands, and between the pains causes it to contract by rubbing it gently; during the contraction he endeavors to strengthen the pains by an ever-increasing pressure, and to force the contents of the uterus in the direction of the axis of the pelvic inlet. As in the Credé's method, the more imperfectly contracted portion of the uterus should be rubbed and kneaded the hardest. A uterus which is abnormally deviated to one side or to the front should be directed more into the axis of the inlet, the pressure should be exerted from all sides on the large parts of the child (breech, head), and the fœtal parts which have slipped to one side of the pelvic inlet should be grasped and pressed back in position.

If the expression is to be performed at the end of the second stage, the direction of the pressure must be changed so as to push the long axis of the uterus a little behind the axis of the inlet. Here, also, the operation can be performed with the parturient on the back; in primiparæ, however, the lateral position is better. While the perineum is protected with the left hand in the right lateral prone position, and with the right if this is reversed, the other hand can grasp the fundus uteri and rub and press upon it until the head of the child, impelled by the former, slowly comes down on the perineum. Here both hands are brought into play in so far that the one which rests on the perineum prevents the other from producing too strong an effect. The practice of expressing the body of the child after the birth of its head is to be especially recommended.

Anæsthesia as a rule is unnecessary; in very sensitive primiparæ it is advisable, since it renders the operation easier by diminishing the rigid contraction of the abdominal muscles. If the expression is unsuccessful, and should the mother or child be jeopardized, extraction must then of course be performed. In this event, however, to avoid a dangerous relaxation of the uterus, the expression should be continued at the same time by an assistant, so as to hasten the extraction.

It is scarcely necessary to say that an over-distended bladder is to be emptied, any fecal accumulation to be removed, intestinal loops to be crowded away from the uterus, the abdominal wall is not to be scratched with sharp finger-nails, and the procedure is not to be roughly performed.

CHAPTER II.

Expression of the Head and Extraction by means of the Shoulders after the Birth of the Head.

LITERATURE.

Ahlfeld: *Archiv f. Gynäk.*, VI, 279, 1874. Bailly: "Du dégagement du tronc après la sortie de la tête fœtale et des avantages du décubitus latéral gauche au point de vue de la manœuvre," *Gaz. d. hôpit.*, Paris, 1882, LV, 1146. Cohnstein: *Archiv f. Gynäk.*, VII, 324. Fehling: *Centralbl. f. Gynäk.*, 1887, XI, 65–68. Hofmeier: *Zeitschr. f. Geburtsh. und Gynäk.*, VI, 138. Olshausen: "Sammlung klin. Vorträge v. Volkmann," Nr. 44. Ritgen: *Monatsschrift f. Geburtshülfe*, VI, 339.

Instead of Kristeller's method of expression, Hofmeier has recommended that the child's head alone, in vertex positions, be selected as the part on which pressure is to be made; this is effected by directly pressing from without upon the occiput and the face from both sides. It is possible thereby, in cases that are not too unfavorable, to force the head into and through the small pelvis; in greatly contracted pelves and in distention of the lower uterine segment we must of course be very careful not to proceed too forcibly.

In the description of the various methods of protecting the perineum we have already considered Ritgen's method, which is employed not alone for the preservation of the perineum, but also for hastening the rotation of the head around its transverse diameter and for its more rapid extension under the symphysis. Further, we have mentioned the use of pressure against the brow of the child from the end of the sacrum forward for accomplishing the same purpose, which was also proposed by Ritgen and lately especially recommended by Fehling. Both are methods of expression of the fœtus which constitute a part of the practice for the preservation of the perineum.

They are also applicable in face and breech presentations and are indicated from the moment when the head remains stationary in the pelvic outlet and the uterine contractions and the abdominal pressure are not sufficient to force it out; and again, if the perineum appears to be very tense in the middle, threatening a central rupture, which is especially liable to occur in occipito-posterior positions where the brow is pressed under the symphysis. In these cases the occiput offers a broad surface for pressure. We shall describe the expression of the after-coming head in the following chapter.

Frequently the shoulders are the cause of delay after the birth of the head. The reason for this may be delayed rotation of the latter, a pendulous abdomen, a mal-position of an extremity against the anterior wall of the pelvis, and lastly, an unusually large circumference of the thorax or of the abdomen. The latter causes have already been considered. If the cause lies in too bulky shoulders or pendulous abdomen, a hard pillow should be placed at once under the buttocks and the head pressed moderately hard against the perineum, in order to hasten the entrance of the anterior shoulder into the small pelvis; at the same time slight backward traction should be made, and the anterior shoulder brought down, if possible, so deeply that the finger can be passed into the axilla; then extraction can be performed by this or by both at the same time. If the anterior axilla is entirely out of reach, the whole hand must be passed into the hollow of the sacrum and the index finger placed in the axilla, the thumb on the shoulder and the middle finger against the arm, and, while the head is depressed the anterior shoulder is sought to be brought down by traction on the body. If this does not succeed, the hand which is in the vagina can push the forearm over the chest in such a manner that it can be slowly extracted, and so as not to fracture the arm. Then this arm is placed against the head of the child, and the body extracted by pulling upon it and the head at the same time; this will avoid separation of the head, as well as any dangerous tearing of the child's neck, whose life is at times saved.

If the child should be already dead after the birth of the head from prolonged attempts at extraction, a blunt hook is inserted into the posterior axilla and traction made at the same time on the head and this shoulder. In a tetanically contracted uterus this form of extraction is sometimes necessary.

All of these attempts at extraction should be aided by appropriate expression applied to the fundus uteri, and chloroform should be used if the genitals are very narrow or the child is very large, and if the manipulations are very painful for the parturient. At times they may consume much time, and it may be necessary to employ an extreme degree of force.

CHAPTER III.

Extraction of the Child by its Pelvic Extremity.

LITERATURE.

Bunge, O.: *Centralbl. f. Gynäk.*, 1885, IX, 742. Pippingskjöld, J.: "Note sur l'extraction de l'extrémité pelvienne en cas d'insuffisance des forces expulsives ou des doigts de l'accoucheur." *Finska läksallsk-handl.*, Helsingfors, 1883, XXV, 126–134. Ramdohr, M.: "Indicationen zur Herableitung eines Fusses bei Steisslage," Marburg, 1882. Rosenberg, P.: "Ein neuer Schlingenführer zur Extraction am Steiss." *Centralbl. f. Gynäk.*, 1885, IX, 742. Siebold: "Geschichte der Geburtshülfe," I, 142.

(*a*) *Extraction by One or Both Feet.*

As we have already seen, Celsus was familiar with podalic version, and he was also conversant with the extraction of children by the feet; before him the Greeks were likewise acquainted with it. Celsus further advised the conversion of a breech into a footling presentation when the labor was delayed. Savonarola advised, in case cephalic version was unsuccessful and one foot was down, to draw down the other one and deliver the child by means of both feet (1460). Eucharius Rösslin recommended the midwife to complete a footling delivery by drawing down the feet and depressing the arms; but he was always of the opinion that it was better to do a cephalic version than to deliver by the feet. It appears that extraction by the feet was chiefly done in the case of dead children. Since Ambroise Paré (1513) has properly established the position of podalic version, the conviction has become firm that extraction by the feet is both possible and necessary with the preservation of the life of the child.

The *conditions* for extraction by the pelvic extremity are: 1. That the mother's pelvis be not so contracted that the crushed child cannot be delivered through it. 2. The cervix in breech presentation must be completely or almost fully dilated; in footling positions it can be dilated gradually by traction on the feet. 3. The membranes must have ruptured and well retracted over the part to be grasped. 4. The same remark applies to the maternal soft parts as to the pelvis.

The extraction is *indicated* if a present or an imminent danger for the mother or child renders any further expectant treatment of the delivery impossible. Most frequently the condition of the child presents this indication, in that the heart sounds sink below 100 or rise above 160 a minute.

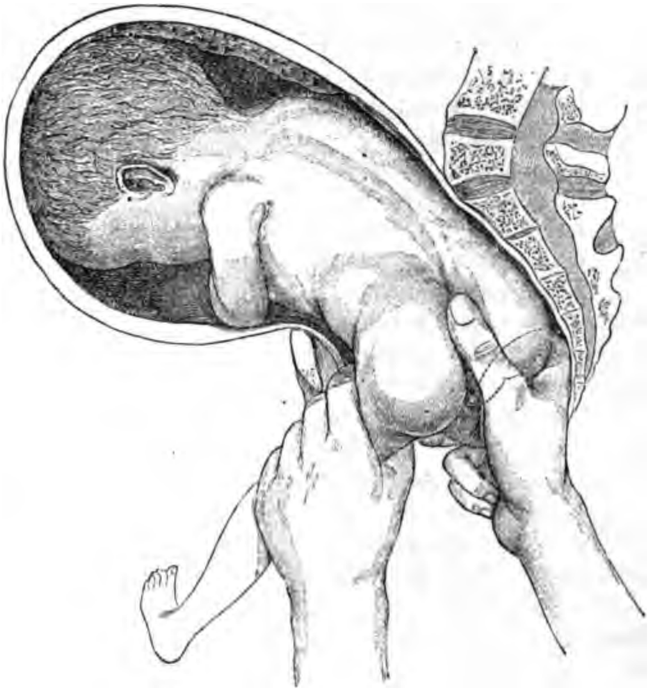
That the escape of meconium of itself is not indicative of danger, is more apparent in pelvic than in vertex presentations of the fœtus.

The operation is best performed in the cross-bed position, and under some circumstances, especially in contracted pelvis, with the parturient on the back. Anæsthesia is unnecessary in multiparæ with wide genitals, but is indispensable if these are small and very sensitive. The feet are grasped in the following manner: If one or both feet are already in the vagina we first seize the anterior one with the hand corresponding to it, and in such a manner that the thumb lies over the heel against the tendo Achillis, the index finger over the instep and the middle finger along the sole of the foot. We draw the foot carefully through the vulva and then in like manner seize the second with the other hand. We now extend the legs and seize each of them with the corresponding hand and make an even, steady traction, so that the back of the child is always directed to one side, and not, as so frequently happens, drawn forward. We should carefully imitate the natural mechanism of labor; and in this the back always remains to one side until the arms and shoulders are completely delivered, turned neither to the front or the back. Where, through no fault of ours, the abdomen of the child is turned more anteriorly, we should bring it more to the side by drawing the hip which lies more forward firmly against the pubic arch; this can also be accomplished by stronger traction on the extremity which should come forward (*Lachapelle*). As soon as the knees are born, we slip our hands above them on to the thighs, and take as broad a grip of the child's body and as close to the external genitals as possible. When the breech is about to be born, the hip which lies anteriorly should be elevated and pressed against the symphysis, whereby the posterior one passes more easily over the perineum (Fig. 149). The extraction should now proceed more in the long axis of the pelvis, which is very frequently forgotten by the operator, to the destruction of the external genitals. If only one foot has come down, we examine continuously with the other hand, while this is being drawn upon, to see whether the breech moves, and seek to pass the index finger as soon as possible around the hip which corresponds to the imprisoned foot, so as to make traction by this means on both sides of the child (Fig. 149). Beginners on the manikin do not know how to commence properly with this second hand. They will either grasp the fundus with it, which is then of little help, or they will seize the leg so as to pull with both hands on one leg, which leads to the application of too much force; or they believe that they must place it over the perineum, which is entirely superfluous. Introduced in the genitals, however, it has the expected and very important advantage of informing us about the rotation of the breech, and thereby giving us the clue as to how to direct the traction.

(*b*) *The Extraction of the Child by the Breech.*

For this operation one condition is indispensable besides those which are essential for the pelvic extremity in general, viz., that at least one hip of the child must be within convenient reach. If such is the case, the extraction can be done with the hand or with instruments. We grasp the hip which is in front and stands the lowest in such a manner that the index finger of the hand corresponding to it is pushed as far as possible into the fold of the in, the thumb is pressed firmly over the ilium and sacrum, and the middle ;er rests against the thigh. The object of the latter is to prevent the ıur from being abducted during traction and thus fractured. Traction is n made until the fold of the groin is visible under the symphysis. During ; time one finger of the other hand examines from time to time until it be passed around the posterior hip, which is grasped in the same manner :he anterior; thus traction is made on both hips in a forward and upward ection. If our grasp continually slips off the anterior hip and it is im-

FIG. 149.



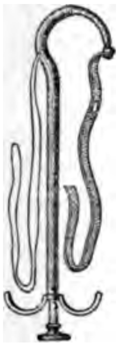
Extraction by the Breech.

ssible to draw the breech down deeper, we must pass over the hip a Bel-q's canula, or better still, since this is not always at hand, a long elastic heter with a stilette. The point of this is introduced between the thighs l in front of the genitals, and a sling is attached to one end of a thread sed through both openings of the catheter; the sling is then drawn over hip with the catheter, and made secure. The ends are then firmly sted around the fist and traction made on them until the posterior hip is hin reach, so that traction can be applied with the hands to both hips. is procedure is the simplest and least dangerous for mother and child.

Rosenberg has recommended for this purpose the accompanying sling-carrier (Fig. 150).

In recent times various different carriers have been devised, but for what reason, if an ordinary elastic catheter answers the same purpose? The obstetrical bag is only made heavier and more expensive, and, moreover, the operation is but seldom performed. All of these instruments find little application except in hospitals.

FIG. 150.



Sling-carrier. *After Rosenberg.*

Instead of the sling a blunt hook is sometimes used. I have seen a skilled operator tear through the skin over the groin with it, exposing the large vessels.

As soon as the breech has been brought through the vulva, in order to prevent any laceration of the perineum the traction must be continued slowly forward and upward, until the umbilicus is visible; the cord is then grasped close to the ring and slowly drawn further down, so that it may not be dragged upon during the remainder of the operation. If the child straddles the cord, a loop of it is to be slipped over the posterior half of the pelvis; if unsuccessful in this, it may be cut between two ligatures, but then the delivery must be completed very rapidly.

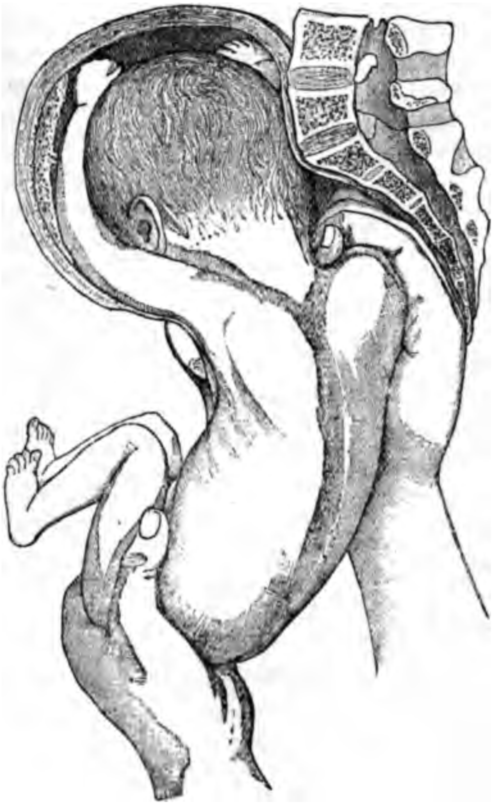
If one foot is bent upward it is not to be drawn down along the trunk, for it will follow the traction on the trunk without any trouble. We can, however, assist its passage outward, in that, if it tends to escape at the side posteriorly, we elevate the trunk and draw it to the opposite side; it then escapes sideways and anteriorly by merely depressing the trunk.

The anterior arm and elbow are to be advanced under the symphysis by depressing the trunk somewhat, after which it is again elevated so as to allow the posterior elbow and arm to glide over the perineum.

If the arms are extended over the head, we must draw the trunk straight down until one shoulder-blade can be felt, and then commence with the disengagement of the posterior arm. This is done because there is much more room around the promontory and posterior wall of the pelvis than between the child and the anterior wall, consequently the extraction of this arm is effected more rapidly, a gain of time which is of vital importance to the child. For this purpose we choose the hand which corresponds to the posterior arm; with the other we raise the trunk at least to a horizontal position, and then advance the thumb, index and middle fingers of the former along the body, so that the thumb is inserted into the axilla and the middle and index fingers rest over the humerus, the ulnar surface of the middle finger being at the elbow (Fig. 151). The whole arm of the child is thus securely grasped and then drawn down over the face and chest. Hence it should first be grasped securely and then traction made; in this manner fracture is prevented, while it is unavoidable if traction be made with the index finger alone, without regard to the position of the face and chest.

The *delivery of the second arm* is then effected without loss of time in this manner: the child's body is dropped until its long axis is a direct continuation of the vertical long diameter of the mother, then the trunk is grasped on both sides and by its means the head pushed perpendicularly from below upward and with it the extended arm; thereby the latter becomes more movable around the head. Beginners generally forget to lower the body, and perform the rotation, which is about to be described, while the trunk forms a sharp angle with the head. The result is that the arm, which has thus been wedged in alongside of the head, meets with an obstruction which makes its delivery more difficult and frequently produces a fracture, and still oftener the child's life is forfeited by reason of the fruitless and tedious attempts made to release it.

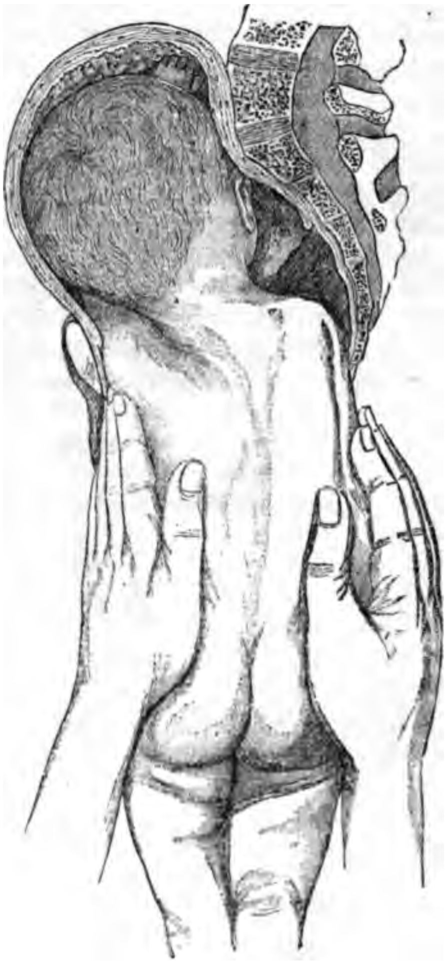
FIG. 151.



Disengaging the Posterior Arm.

As soon as the arm is loose alongside of the head, the child is rotated about its long axis so that the arm, which has been anterior, passes along the same side of the pelvis backward and rests in front of the sacro-iliac synchondrosis. By this manipulation the back is moved from one side to the front and then to the opposite side (in the first breech position, from the left side forward and to the right). The arm thus describes one-quarter of a revolution through the pelvis, viz., from the anterior extremity of one oblique diameter to the posterior end of the other; we can perceive that it

FIG. 152.



The manner of grasping and holding the body for rotating the second arm backward.

follows the rotation of the body if the scapula does not cause any projection outward of the skin over the back.

If the arm is very firmly wedged in, or if it is pushed behind the occiput, then this quarter revolution through the pelvis will by no means succeed. We must then turn in the opposite direction and perform the so-called three-quarter rotation; in other words, first turn the abdomen of the child forward and then rotate its back to the opposite side.

The delivery of the anteriorly extended arm from behind the anterior wall of the pelvis is very exceptionally accomplished in the dorsal decubitus of the parturient with a well-marked pelvic contraction, by forcibly depressing the child's body.

If the second arm has been brought to the back of the pelvis, it must be grasped by the hand corresponding to it and delivered just like the first.

The child's body, moist and slippery, cools rapidly during these manipulations, and as a result premature efforts at respiration are made, which are visible to the eye. The child will be grasped more securely and premature respiration be more easily avoided, if the trunk is wrapped in a warm soft towel, as soon as the cord is born. Yet it must never be forgotten, whether the child's trunk be grasped directly or indirectly, that the abdomen and thorax must be guarded against any undue pressure.

If the back of the child is directed anteriorly or posteriorly and the arms lie on either side of the pelvis, then the body is to be turned to one side, so that one arm rotates forward and the other backward, and the delivery completed in the usual manner. The main thing to remember is that the trunk must be depressed and the head pushed up along with the arms out of the small pelvis, in order to make them more movable.

The so-called rupture of the liver of the child by the uterine contractions is only the result of too forcible manipulations on the part of the obstetrician, and has never been observed in spontaneous deliveries.

To deliver the after-coming head haste is necessary, for each contraction of the uterus jeopardizes the life of the child by pressure of the cord against the hard cranium, leaving out of consideration any partial detachment of the placenta and the premature efforts at respiration above mentioned.

Methods of extraction of the after-coming head are: 1. *Extraction by the trunk alone;* 2, *by the trunk and head, and* 3, *by the head alone.*

The methods to deliver the after-coming head as rapidly and safely as possible are very old, and have been often modified and combined in many ways. An historical retrospect is at this point especially interesting. We find the following methods:—

1. Both hands are introduced and with them the head only is grasped and retracted. Hippocrates: "De superfœtatione." Basle, 1546. Ed. Cornarius, p. 66.

2. The severed head is pressed from without into the pelvis with both hands and extracted from the vagina with hooks. Celsus, Liber VII, 491.

3. The severed head is extracted with a finger introduced into the mouth and one or more hooks. Paulus Ægenita: "De fœtus immortui extractione et exsectione." Cap. 74.

4. Traction on the body, sternutation of the parturient and light compression of the lower portion of the abdomen. Abulcasis, Liber II: "Exitus embryonis super pedes suas." Jacob Rueff, 1580 (Hebammenbuch, s. 74).

5. Traction from the mouth on the lower jaw and the shoulders. Mauriceau: "Traité des mal. d. femmes grosses," Paris, 1668; Marguerite de la Marche, 1677; Paul Portal, 1685; Chapman, 1735; Levret, 1747; Roederer, 1759; Fries, 1769; Prange, 1760; Baudelocque, 1781; Stark, 1801; Lachapelle, 1821; G. Veit, 1863. Modification by Stein, 1783; Steidele, 1784.

6. Traction on the lower jaw and the feet. Peu "Pratique des Accouch.," Paris, 1694.

7. Traction on the lower jaw, and on the shoulders and the feet by an assistant. Mauriceau: "Traité des mal. des femmes grosses." Dernière édition, Paris, 1683; Dionis, 1718; Puzos, 1759; Lachapelle, 1821 (Pratique, etc., 334–335); Ahlfeld (1875), *Archiv f. Gynäk.*, VIII, 360 (1887); "Ber. u. Arb. aus Marburg," 1887, p. 150.

8. Traction on the upper jaw internally, and pressure on the head externally. L. Heister, 1718.

9. Traction on the lower jaw and pressure against the occiput internally. De la Motte: "Traité compl.," 1725, p. 412; Mesnard, 1748; Roederer, 1759.

10. Traction on the lower jaw with two and on the upper with one finger, and traction on the shoulder. Giffars, 1734.

11. Traction on the upper jaw and pressure against the occiput internally. Smellie, 1752; Josephi, 1797; Busch, 1801; Froriep, 1818; Ritgen, Joerg, 1820; Wigand, 1820; Lachapelle, 1821.

12. Traction on the body and depression of the neck backward with the thumb of the other hand. Japaner, Shauron von Genjetz Kagama, 1751 or 1754

13. Traction on the body alone over the shoulders with both hands. A. Petit, 1753.

14. Pressure from without on the head and traction on the shoulders. Pugh, 1753; Kiwisch, 1846 ("Beiträge zur Geburtskunde," I, p. 69); Goodell, 1873.

15. Traction by the operator on the lower jaw and shoulders, and by an assistant on the body of the child, and pressure by a second assistant from without on the head. Eschenbach (Rostock), "Grundlage zum Unterricht einer Hebamme," II Aufl., Rostock, 1687.

16. Hooking the chin to flex it on the neck, expression of the head by pressure upon the occiput at the brow externally. Wigand, 1800 ("Beiträge zur theor. und prakt. Geburtshülfe," II Heft, Hamburg, 1800, p. 118); Lachapelle (loc. cit., p. 336–338); K. Ruge (*Zeitschr. f. Geburtsh. und Frauenkrankheiten*, von E. Martin, I, p. 82, 1876); Champetier de Ribes, 1879 ("Du passage de la tête fœtale à travers le détroit supérieure rétréci du bassin," p. 78, Experience IX); A. Martin, 1886 (*Berl. klin. Wochenschrift*, 1886, p. 660); Winckel: Verhandlungen des II gynäk. Congress, Halle, 1888.

17. Pressure on the head from within and traction on the body. Ritgen, 1820 (*Monatsschrift für Geburtskunde*, VIII, 233); Credé, 1854 ("Klinische Vorträge über Geburtshülfe," p. 763).

18. Traction on the trunk alone, by the shoulders and feet (the Prague manipulation). Kiwisch, 1846 (comp. No. 14); Scanzoni, 1851.

19. Traction on the upper jaw, pressure against the occiput internally and pressure on the head by an assistant externally. Wigand, 1820; Ritgen, 1848, Credé, 1854; Ed. Martin, 1865 (*Monatsschrift für Geburtskunde*, XXVI, 434).

20. Depression of the head into the small pelvis and then extraction combined with expression. Kristeller, 1867 (*Monatsschrift für Geburtskunde*, XXIX, 383).

21. Traction on the shoulders by the operator and an assistant, lighter traction on the lower jaw. Ahlfeld, 1887 ("Ber. u. Arbeiten aus Marburg," 1887, p. 151). Of these 21 different methods the action is:—

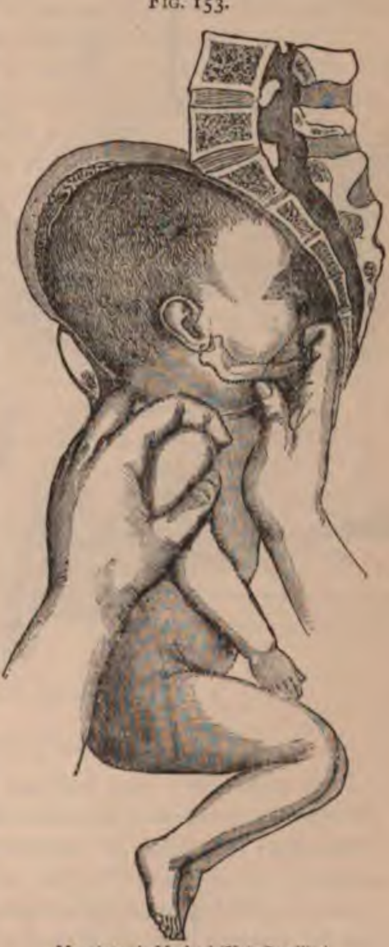
(1) *By traction only and upon the head alone*, in Nos. 1 and 3; upon the body alone, in Nos. 13 and 18; upon head and body, in Nos. 5, 6, 7, 10.

(2) *By traction and pressure and upon the head alone*, in Nos. 2, 8, 9, 11, 16, 19, 20 upon head and body, in Nos. 4, 12, 14, 15, 21.

(3) *By pressure only*, in Nos. 16 and 17.

Of all these manipulations the one which is to-day most frequently used is the so-called Veit-Smellie's (No. 5), which was described by Mauriceau in 1668. It was performed, in order to avoid the use of forceps, with good results, and a careful research compels us, in justice to all concerned, to call it the Mauriceau-Lachapelle method, since Mme. Lachapelle first emphasized its great advantage. Levret, Smellie and G. Veit have not changed it at all. The latter made it popular again in Germany at a time when it was no longer known by most German operators. This method makes use of the body and head at one and the same time as points on which to make traction. Immediately after the second arm is liberated, an examination is made to ascertain the direction of the child's face, which is then rotated backward by the index and middle fingers of the corresponding hand, previously introduced into the mouth. The body of the child is laid astride of this arm, and the other hand, as in the Prague method, is placed over both shoulders and the upper part of the back. Downward traction is then made until the chin is at the posterior commissure, when the head is freed from the vulva by elevating the child's body and slowly rotating the head about its transverse diameter; we can thus avoid a laceration, without any direct protection of the perineum. Lacerations of the floor of the child's mouth (rupture of the muscles and hæmatoma), which are of little importance, do occur, and sometimes a fracture of the jaw, which has happened to me once in the case of a dead

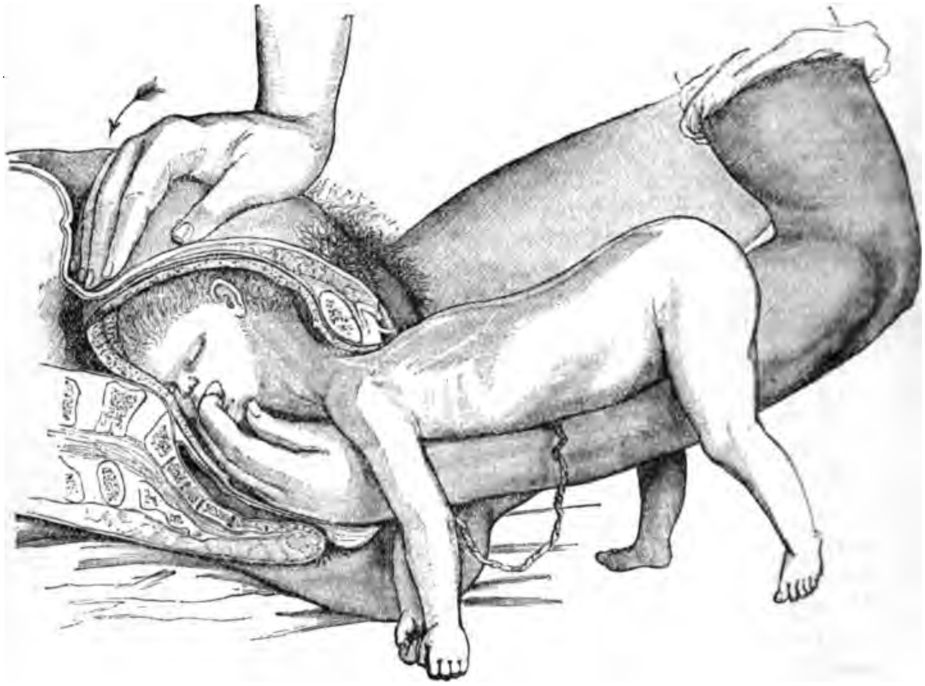
FIG. 153.



Mauriceau's Method (Veit-Smellie.)

child (*Berl. klin. Wochenschr.*, 1864, No. 9). If, however, the thumb is placed against the base of the jaw, and the fingers are pushed well into the mouth (a point which is almost always forgotten by beginners), these lacerations may be avoided (see Fig. 153.) But since serious injuries may be inflicted on the neck and vertebræ (compare K. Runge, *l. c.*, under No. 16), this method, in difficult cases, will certainly be superseded, in time, by the one which has been described under No. 16.

FIG. 154.



Wigand-A. Martin's Method of Expressing the After-coming Head.

Method of Wigand-A. Martin.

It is as follows: The first and second fingers of the hand whose palm corresponds to the face are introduced into the mouth, and the lower jaw is directed to the middle of the pelvis, after which the child's body is placed astride of the arm, and then the fœtal head is forced down through the small pelvis by pressing upon the occipital region. The seizure of the chin serves less for traction than for directing the passage of the head outward, which latter is accomplished mainly by the expression. During this pressure upon the occiput toward the brow, the head is rotated about its transverse, and at the same time turned somewhat about its sagittal axis, so that the point of the wedge, namely, the chin, descends nearly in the median line, and the parietal bone, which was directed posteriorly, is pushed down under the promontory. Champetier de Ribes proved by experiments, and K. Ruge by a case in practice, that this method will succeed when that of Mauriceau fails, and the author has shown, experimentally, that, by this method, the head of a fully-developed child can be brought through a pelvis with a conjugate of 6 cm. in the short time of from 15 to 75 seconds. For these reasons this method will soon supersede all others.

Moreover, the assistant, if at hand, must always aid the expulsion of the head by pressure on the fundus uteri in the manner described above, whether the extraction be by the body alone or by the body and head.

In rare cases, sometimes but once in a number of years, the child's face does not rotate backward, but forward, and the chin comes under the symphysis. Then it is possible, under favorable conditions, to deliver the head without instruments, by seizing the body with one hand over the thorax and shoulders, and the feet with the other, and then extending it, stretched over a large arc of a circle, above the abdomen of the parturient. First the occiput and then the brow and face glide over the perineum. If we can reach the mouth, we draw down the jaw and the face to the brow behind the symphysis, and deliver the occiput slowly over the perineum by elevating the whole body with the other hand. If this rotation of the head is impossible, and the mouth is out of reach, nothing remains to be done except to extract the head with the forceps.

In high breech positions, where no part or only a small segment of the breech has engaged in the small pelvis, if the rapid completion of the birth is indicated, we introduce the hand which corresponds to the belly of the child, and bring down the foot corresponding to the side which lies anteriorly, and extract on this, following all the precautions enumerated in the chapter on the direct internal version. We select the anterior and not the posterior foot, because the normal mechanism of labor is more closely imitated with it than with the latter.

CHAPTER IV.

The Forceps Operations.

LITERATURE.

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History.—The oldest instruments resembling a pair of forceps were designed to extract the head of a dead child or one diminished in size. The invention of the cephalic forceps belongs to the Chamberlen family of London. In 1670 Hugh Chamberlen went to Paris to sell his secret to the physician in ordinary to the king for 10,000 thalers and asserted, when he heard of a woman whom Mauriceau could not deliver, that he would free her from her pains within fifteen minutes. But he was unable to terminate the labor even with his instrument, and the woman died undelivered; at the autopsy it was found that the uterus had been ruptured in several places. Chamberlen returned to London, and later, being a partisan of James II, was obliged to flee from London to Amsterdam, where he sold his secret to Koonhuysen. The latter retailed it at a high price to other obstetricians; and when all the prominent accoucheurs in Amsterdam had become acquainted with it, the Medico-Pharmaceutical College passed the law: "No obstetrician would be permitted to practice his art who could not prove that he possessed the secret of the examiners," which had to be bought from the latter at a high price. This "close corporation," as Osiander called it, did not last long; for, in 1753, the great secret was bought by Vischer and de Pall, and made public, and to the astonishment of everybody it turned out to be a simple lever which had been known for a long time. In the meantime Johann Palfyn, who had been secretly investigating the Chamberlens' secret in England and Holland, exhibited before the Paris Academy an instrument which was intended to deliver the head when firmly engaged in the pelvis. From that time these true forceps, which consisted of two levers without any openings and lock, and two wooden handles, became public property, and many changes and improvements were made in them. In 1818 it was established beyond a doubt, by finding, in a secret closet of a house formerly owned by Dr. Peter Chamberlen, a chest of instruments, among which was a pair of forceps, that the instrument of Chamberlen was not a lever, but, in fact, true forceps. As is now well known, Dr. Peter Chamberlen, the elder, born in 1560, in Paris, who was the son of William Chamberlen, a physician practicing in Paris, of noble Norman extraction, was the true inventor of the forceps. Between 1588 and 1596 he removed from Southampton to London, and he, his uncle and brother and the latter's son, carefully guarded the secret of this invention. But even in Hugh Chamberlen's time the English obstetrician Drinkwater (1678–1728), according to the statement of Johnson, possessed a pair of forceps which were very similar to Chamberlen's. Still, the instrument only became the common property of all obstetricians in England in 1730, through Chapman, Giffard and Hody. The lock of Chamberlen's forceps consisted of a rivet on the left blade, and a notch at a corresponding point on the right, which fitted around the former. The crossed blades were securely fastened by tying this portion of the lock. At first they were perfectly straight and had only a cephalic curve. Levret, 1748, gave them a second curve for the maternal pelvis, and provided it with a movable axis and a sliding bolt on the right arm for fixing the axis. The instrument since that time has been very frequently altered, and there are now over a hundred modifications of it. A description of each of them would fill a large book, for only a few decades back scarcely anybody considered himself a true teacher of obstetrics, unless he could exhibit a modified forceps bearing his name. We must be thankful for every improvement of an instrument which is so very useful, and the fact must be also emphasized that such improvements have been accomplished even in the most recent times.

The instrument consists of two double-armed levers crossing each other at the lock, whose metallic fenestrated portions, which are applied to the head, are called the blades or spoons, and whose lower part is designated as the neck of the forceps. The lock is at the point where the blades cross, and close to it are two small sloping projections on the outer surface of the handles.

The qualifications of a good instrument of this kind are:—

It must be 30–35 cm. long, of which 20–30 cm. are allowed for the blades. Its cephalic curve, = 7 cm., must not be too far from the points of the blades, at about 8.5 cm. The pelvic curve must measure in long forceps 8–10, in short ones 6–8 cm. The points of the blades must be separated 5 mm. from each other. The blades themselves must be fenestrated and the margins broader than they are thick.

The lock must be strong and easy to fasten. The handles must not be too thick or too long (shorter than the blades), and must be provided with cross-pieces near the lock.

In regard to the lock, we distinguish: (1) The junctura per contabulationem. This so-called English lock has a flat projection jutting out from above on the left and from below on the right blade, in addition there is a knee or short projection on their sides to prevent their slipping on each other. This is more difficult to close than the one with a pin, but holds the lock more securely.

(2) Junctura per axin: originally, as has been already stated, found on the English forceps, later, however, especially designated as the French lock. On the left arm there is a pin which is passed through an opening or is laid into a notch on the right blade. The upper blade is fixed against the lower by a metallic bolt or head.

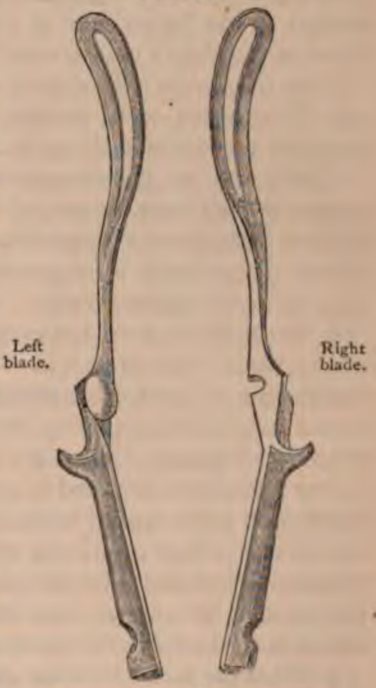
(3) A combination of both locks is seen in the forceps of Busch, Jungmann and others, consisting of a pivot under a flat projection on the left and a notch on the right blade. Junctura mixta. The blade which is passed with the left hand into the left side of the mother's pelvis is called the left, and that which is passed with the right hand into the right side, the right. If the lock has a pivot, the blade with this and which goes underneath is called the male, and the one which is provided with a notch, the female or upper blade (Fig. 155).

The Action of the Forceps.

This should be a double one, viz., the traction upon and withdrawal of the head, and at the same time its rotation so that its escape corresponds most closely to nature. This rotation is a leverage action; the chief point is the traction, since rotation is produced spontaneously by the pelvic openings and the soft parts. We could very easily prevent rotation, and we should therefore allow it to occur rather than be active in producing it. Generally we have to effect a double rotation of the head, namely: (1) that about its greatest oblique diameter, whereby the respective parts rotate more anteriorly and come under the pubic arch; and (2) a rotation of the head about its transverse diameter, by which we carefully deliver it through the external genitals.

Any decided pendulum and rotatory movements with the forceps, which were formerly made as a rule, so as to advance the head by lever movements, especially when it was engaged transversely in the pelvic inlet, are very objectionable, because of the great danger of extensive contusions of the maternal soft parts; moreover, they are unnecessary if the direction of the traction is correct. A gentle, short side motion is to be recommended until the resistance is overcome, to guard against the instrument slipping out suddenly and to prevent a perineal laceration.

FIG. 155.



Forceps with the Naegele-Bruenninghausen's lock.

On the other hand, the object of the forceps is in no sense to compress the head; the handles should be brought together just enough to grasp the head, and only so firmly that the blades do not slip off.

In order to prevent dangerous compression of the child's head, the blades, when properly applied, should seize, as nearly as possible, both poles of its transverse diameter; they would then lie over the parietal bones, with their points at the base of the skull. Since the child's head generally engages in one of the oblique diameters of the pelvis, we shall be compelled, in order to secure this position of the forceps, to lock the blades approximately in that oblique diameter which is not taken up by the head. Whoever has performed a series of forceps operations will gain an experience which will make him master of any instrument. Almost all of the new instruments of Busch, Jungmann, Naegele, Bruenninghausen, Schöller and others—with the exception of specially constructed axis-traction forceps—answer the above requirements, no one of them possessing advantages over the others.

A measuring device, the so-called *dynamometer*, to be attached to the forceps in difficult operations to give warning of the danger that may threaten the mother or child through the application of the force which is brought to bear on the child's head, and by this means to furnish an indication for perforation and cephalotripsy, is to be condemned, since, apart from the fact, that the blades that are to be compressed by our traction become very yielding with frequent use, the most powerful traction can be applied to the head in a wrong direction without moving it, while it follows rapidly and easily if traction is properly made. Kristeller's so-called dynamometric forceps possess a slight advantage in that the transverse projection is placed a little higher up on the right blade; in this the middle finger fits with its first phalanx on the longer arm of the lever, and the pressure against the two halves of the child's head is equalized.

If the forceps are to be applied to the advantage of both mother and child, and all dangerous results avoided, the following conditions must be fulfilled before we proceed to their application.

Conditions:—1. The os must be fully or almost completely dilated, *i.e.* measure at least 8 cm. across; if not, the forceps may slip, the os offers too great an obstacle, and the head can only be pulled through an insufficiently dilated os uteri with a dangerous amount of compression of the skull and deep lacerations of the cervix.

2. The *pelvis* must not be too narrow; it must permit the extraction of the non-mutilated head through it. The width of the pelvis cannot be given in centimetres, as to when an attempt at forceps delivery is permissible. It cannot be said, as Spiegelberg states, that the forceps should never be applied when the conjugate measures less than 8 cm. If it measures 7 cm. we could induce premature labor, and in such a case it might occur that the forceps would have to be applied to the presenting small head. Since living children can still be born at full term when the conjugate measures less than 8 cm. (compare Winckel: "Klin. Beobachtungen zur Dystokie durch Beckenenge," pp. 19–44), we can most certainly extract living children through such contracted pelves with the forceps.

3. What has been said of the pelvis, applies also to the maternal *soft parts*, in case they contain any tumors.

4. The *membranes* must be ruptured and retracted over the head, otherwise we would grasp them with the forceps and detach the placenta, which would endanger both the mother and child.

5. *The head must be engaged* in a position which is suitable for the application of the forceps; it must not be too high, and must be firm in a position in which it can pass through the pelvis; it must not be engaged in a faulty position (for example, brow or face position with chin directed posteriorly).

6. The child's head must not be *too small or too large*, else the cephalic curve of the forceps would not fit and the instrument would slip, there-

injuring the head. Consequently, hydrocephalus is a contra-indication to the use of the forceps.

7. If the operation is likely to be a difficult one, the *child must be living*, otherwise perforation would be less apt to injure the mother.

Under these conditions all the indications for the use of the forceps are contained in this one sentence: The forceps are indicated in vertex or face presentations, if a danger threatening the mother or child, or both, calls for the rapid completion of the labor.

Indications.—The indications, *on the part of the mother*, may consist in :—

1. Extreme prostration, resulting from prolonged efforts at expulsion.
2. Temperature above 101.3° F.
3. Serious hemorrhages.
4. Convulsions.
5. Bruising and compression of the maternal soft parts.
6. Accidental complication in the form of acute or chronic diseases, as pneumonia, typhoid fever, cholera, tuberculosis, epilepsy, etc.
7. Varicosities which are on the point of rupturing, because this accident can be avoided with the forceps by first pushing up and then rapidly delivering the head.

The most frequent indications, *on the part of the child*, are :—

1. A decline in the fœtal heart sound below 100 beats, not only during a pain but also in the interval, or their arrest.
2. A continuous, well-marked rise of the beats above 160, with a weakened impulse.
3. A prolapsed cord, if the pulsations are still present or have ceased but a short time.

In general, however, I must warn against two indications which are customarily advanced in the text-books. They are :—

1. Weak pains. These by themselves can never indicate the forceps, but form at most a contra-indication, since delayed expulsion of the placenta and profuse hemorrhages must necessarily result from extraction with the forceps. Weak pains call for external and internal treatment (see page 510), and we ought to think of the forceps only, provided all these means have failed, when some danger to the life of the mother or child rises, such as we have described above; then it is not the weak pains but this danger which indicates the use of forceps. Perhaps this deduction may be considered a theoretical nicety or merely a correct expression; by all means let it be the latter. Very frequently practitioners, I am sorry to say, save themselves the trouble, or do not take the time, to employ external and internal measures for combating weak pains, but resort to the forceps, because they believe that in them they have the surest means of overcoming the difficulty. True, the child is thus extracted, only the means is the most dangerous one of all in these cases, and would certainly be employed less frequently in private prac-

tice if every physician could foresee its bad results. The first of these is generally a considerable hemorrhage from the placental site, since the placenta is only partly detached, and the lacerated sinuses are not sufficiently closed by the uterine contractions. If the bleeding is not controlled by rubbing the uterus or by injections, if the placenta is not delivered by strong pressure, then a diagnosis of abnormally adherent placenta is made, the hand is at once introduced into the uterus and it is separated from the uterine wall. It is possible to explain this only by assuming that the artificial separation of the placenta, together with the forceps operation, as Ploss has already shown, are often done as "operations of convenience." Whoever has any idea to what dangers he may, and frequently does, subject a parturient by such "operations of convenience," should understand that they are not "operations of convenience" but are unjustifiable ones. Here, if anywhere, Schiller's words are most appropriate:—

> " Das ist der Fluch der bösen That,
> Dass sie fortzeugend Böses muss gebären."
>
> " It is the curse of evil deeds,
> That they give birth to further evils."

The evil deed is the application of the forceps for weak pains; its after-results, the hemorrhage bleeding and the anxiety produced by it, the hasty action of artificially separating the placenta from the uterine wall, which has sent so many poor women to an early grave.

If, in spite of the presence of weak pains, the forceps must be applied, 0.05–0.1 gm. of ergotin should be given hypodermatically before beginning the operation. The extraction must be done slowly, by the aid of the pains, and after the delivery of the child the hand ought not to be removed from the fundus uteri, nor ought the expulsion of the placenta to be hastened.

It has been stated that the pains are better stimulated by the blades of the forceps than by a catheter, that the labor is thereby hastened and this particular trouble overcome. This does occur, but it is the exception which we dare not count upon. The best proof of this is that hemorrhages and manual detachment of the placenta occur much more frequently after such operations than otherwise. This danger has been somewhat diminished since the introduction of Credé's method, but is by no means done away with.

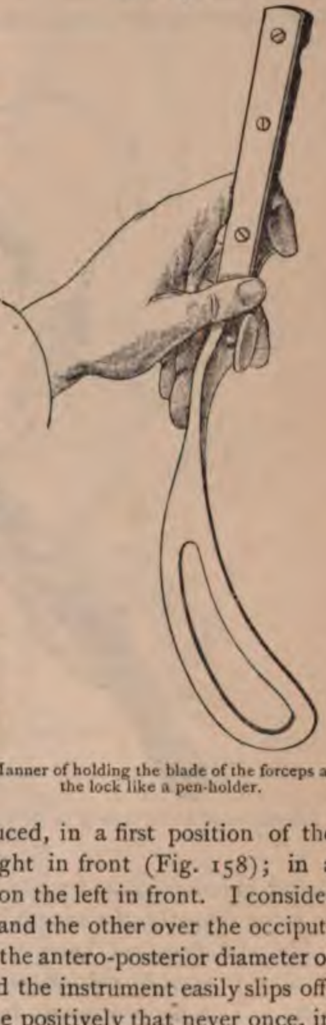
2. That pelvic deformity is just as little an indication for the forceps as weak pains are, has been already thoroughly discussed on page 499.

The child presents an indication for the use of forceps, by far the most frequently, by a diminution or increase in the frequency of the heart sounds. Just here lies the chief distinction between hospital and private practice, that in the latter the condition of the mother, her apparent exhaustion or weak pains or pelvic deformity, is given as an indication, because—we say it openly—the condition of the child is not always satisfactorily looked after in private practice by careful and repeated auscultation of its heart beats.

Performance of the Operation. (*a*) *With the Head at the Pelvic Inlet.*

I. *In vertex positions. First step.*—The parturient, on her back, is brought to the edge of the bed. The operator introduces four fingers of the right hand in front of the left sacro-iliac synchondrosis (because there is always room here), grasps a blade like a pen-holder (Fig. 156) and carries it up between the hand and the head without using any force (Fig. 157). The assistant holds this blade while the operator lubricates the other; he then introduces half of the left hand into the right side of the pelvis and carries the right blade up above the linea innominata. Hence, with rare exceptions, each blade is passed along the posterior wall of the pelvis in front of the respective sacro-iliac synchondrosis. As soon as this is accomplished, the operator, in the first position of the head, grasps the left blade at the lock with the left hand, and while he holds this quietly in its proper place, he performs a triple motion with the handle of the other one. He first depresses it, rotates it on its long axis and carries the end of the handle to the left; the right blade is thereby brought from the right posteriorly past the side of the small pelvis to the anterior pole of the left oblique diameter, so that the transverse diameter of the forceps corresponds to the latter (Fig. 158). This triple movement of the blade is called *adaptation* (Wandernlassen). Even if the head stands transverse in the pelvic inlet, it is absolutely necessary, according to my experience, to apply the blades of the forceps to the oblique diameter, which means that they are to be introduced, in a first position of the head, on the left side behind and on the right in front (Fig. 158); in a second position, on the right side behind and on the left in front. I consider it a mistake to apply one blade over the brow and the other over the occiput, because the child is thus easily injured; besides the antero-posterior diameter of the head is too large for the cephalic curve and the instrument easily slips off, since it acts like a pair of pincers. I can state positively that never once, in several hundred forceps operations, have I been placed in a position where it was not possible for me to grasp the head at least obliquely, and considering the amount of material that has been at my disposal during twenty-six years and

FIG. 156.



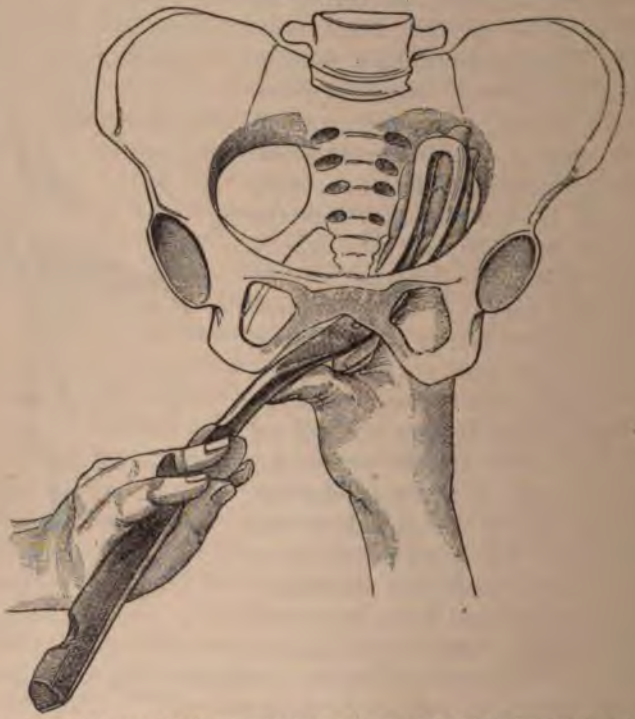
Manner of holding the blade of the forceps at the lock like a pen-holder.

all the varieties of deformities of the pelvis (osteo-malacia, rickets, spondylolisthesis, etc.), I probably stand second to no German physician in experience.

In the second vertex position the left blade must turn as soon as its point has passed the linea innominata, and the right hand being withdrawn the handle is depressed with the left hand, turned about its long axis and carried to the right.

Beginners constantly make two mistakes on the manikin. The first one is, that only two phalanges of the hand are introduced into the vagina, thus merely touching the presenting part, and the blade of the forceps is inserted almost simultaneously; while the latter is being pushed forward, the hand, or more properly, the examining fingers, are withdrawn (!).

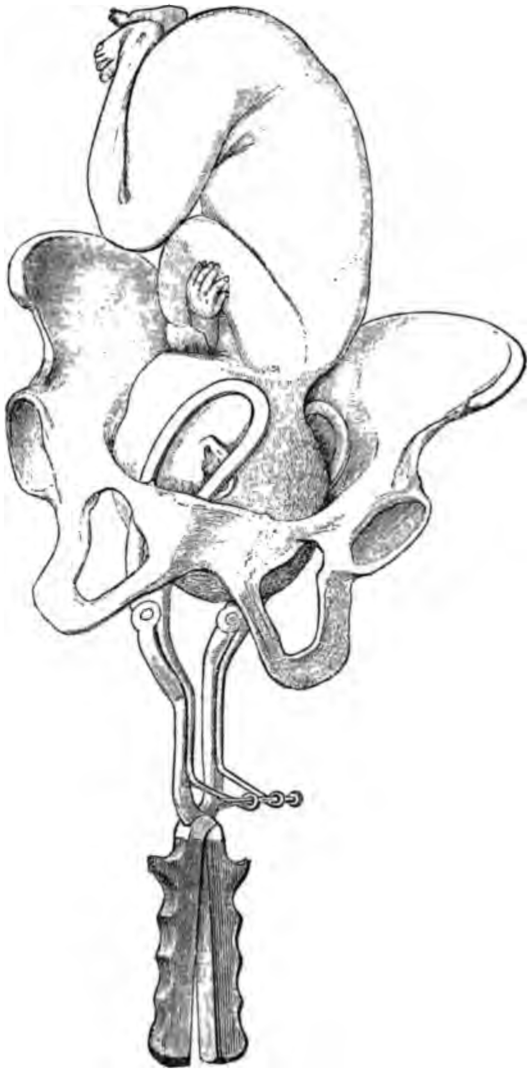
FIG. 157.



Introduction of the left blade of the forceps with the right hand on the left, in front of the left sacro-iliac synchondrosis.

He who does not know what purpose the introduced hand serves and whither it must be carried, will never learn how to apply the forceps properly. This hand—two or four fingers—should grasp the child's head as broadly and as high as possible at the point where the forceps blade is to come; if our hand can be carried up to the base of the skull, the insertion of the thin blade between it and the skull will be easy. The hand, during the application of the blade, remains quiescent, in other words, it is the road along which the blade is to travel; the child's head, as well as the genital canal, will thus be guarded against any dangerous pressure, and we know exactly where the forceps lie.

FIG. 158.



Position of Breus' forceps in the left oblique diameter.

The second mistake is, that as soon as the point of the blade meets with any obstacle, the hand which is inserting the instrument imperceptibly changes its hold, grasps the handle with the fist and seeks to overcome the resistance by force. The result is that the blade, while the guiding hand slips back, goes up with a jerk and injures mother and child. If we adhere strictly to the principle only to introduce the forceps blade like a sound, never to seize it in the fist and not to force it past an obstruction, but to go around it by rotary and lateral motions, we shall avoid such injuries and at least the application of the instrument will be free from danger. It is easy to understand that gripping of the os cannot be avoided with certainty if the fingers are not carried around the head but only touch it.

Second step.—The locking of the forceps. If both blades are properly applied, the lock comes together, even when the head is large, without any force; the seizure of hair or mucous membrane being avoided. If there is any obstacle to their closure, no force must be used to overcome it, for this would result in injury to mother and child, but examination must be made to discover the cause and to readjust one or both of the blades. If the blades twist, the one which is not in the proper position must be removed, and eventually be reapplied. During the locking the thumbs rest on the transverse projections and the four fingers around the handles.

A mistake, which is almost constant with the beginner is, that he, while he locks the instrument, wrongly turns the first blade toward the second. For example, in first head positions, he turns the handle of the left blade and elevates it more, because he has not carried the right blade far enough forward, and as a consequence meets with an obstruction. Of course the trouble is thereby increased, and the correctly applied left blade is brought into a wrong position.

Third step.—After locking the blades, the position of the head in the forceps is to be accurately determined, particularly as to whether the small fontanelle is in the same position as before, and whether the inner surface of the blades lies flat against the scalp. If this is the case, the external hand, which is placed over the projections alongside of the lock, to prevent the latter from springing apart, makes a preparatory traction, while the operator ascertains, by two fingers placed against the skull, whether the head follows the traction. With this traction a slight forward rotation of the forceps, which at the commencement correspond with one of the oblique diameters of the pelvis, must be made. Then follows the

Fourth step.—The extraction of the head, which, according to its position in the pelvic inlet, is begun in the *first position* (of the forceps) with the handles directed downward. Then we make traction slowly and evenly, not in a jerky manner, and in general without rotation. The turning of the forceps about its long axis is carried only so far that its transverse diameter corresponds to the transverse pelvic diameter. As soon as the head is visible between the blades, we bring the handles to a horizontal—*second position*—and, when the perineum begins to stretch and the anus opens, we carry them upward in the *third position* in order that we may roll the head out under the symphysis about its transverse diameter. At the same time we protect the perineum with one hand and do not entrust it to an assistant. As a rule, up to this point only one hand makes traction on the handles in the easier cases, while the other examines and controls the position and rotation of the head. In difficult cases we must pull with both hands, pausing from time to time to examine and wait for a pain. It is best to extract the head entirely. If the vulva is very narrow, and we can feel the face and chin through the rectum, the forceps are to be removed and the head is delivered by Ritgen's method, incisions being made in the margin of the vulva at the same time if necessary. The danger for mother and child is by no means over with the birth of the head; if the shoulders do not follow, we must extract by the one which lies posteriorly.

II. *In occipito-posterior positions* a change in the method of the operation which has been described above is necessary: we must make traction for a longer time in the first position, since the face has to follow the brow, and the engagement of the latter is more difficult. When the glabella is felt close under the symphysis, we elevate the handles directly into the third position without any traction, so that the occiput passes over the perineum, which is especially endangered by this manœuvre. As soon as the occiput is born, we depress the handles again into the second position, and by this means guide the face from under the symphysis.

III. *In face presentations* the lock must be fastened in the second position of the handles, so that the blades rest upon the child's occiput. If, on the contrary, they lie on the base of the skull and are then pulled down, the brow advances still deeper and the forceps slip off. If the occiput has been grasped, we depress the handles in the preparatory traction into the first position and draw the chin downward with a slight rotary motion, and at the same time to the front. As soon as this has come under the symphysis and is firmly engaged, we pass directly, without further traction, into the third position and thereby advance the brow and the occiput over the perineum.

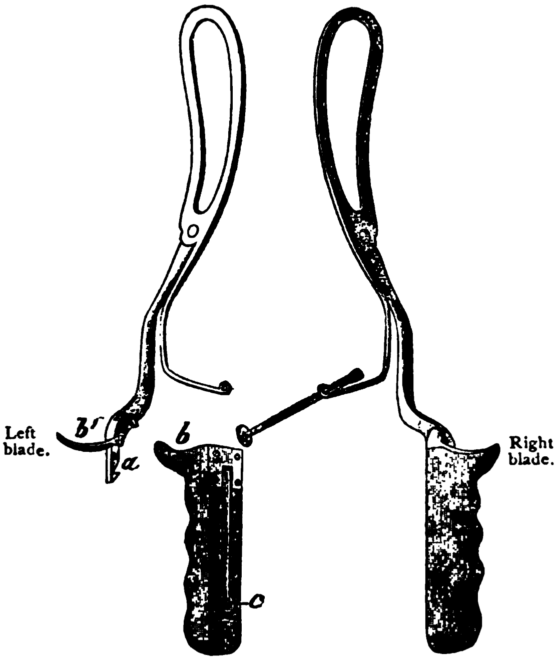
(*b*) If the head, whether it presents in a vertex, face or occipito-posterior position, is in the cavity of the pelvis or at the pelvic strait, the parturient is placed on her back with her hips elevated, the forceps are introduced on two fingers and locked in the transverse diameter of the small pelvis, and it is only necessary to make traction in the second and third positions. In occipito-posterior positions traction is made first in the third and then in the second; in face and vertex presentations, first in the second and then in the third.

(*c*) In face presentations with the chin directed posteriorly (compare page 393), the forceps can be applied for the purpose of rotating the chin to the side; if the latter is on the right and posterior, in the left oblique diameter; as soon as it has been rotated to the right, in the right oblique diameter. Conditions: the face must be in the pelvis, the child alive, the disproportion between the size of the child and pelvis must not be too great; it is then possible at times to save the child. In brow and face presentations, with the chin posterior and in the pelvic inlet, the forceps are contra-indicated.

(*d*) In prolapse of the extremities or the cord alongside of the head, we must guard against embracing them with the forceps. In such cases, and especially if we anticipate that the introduction of the right blade will be very difficult because of an asymmetrical condition of the pelvis, the latter has to be introduced first and the left one over this, and finally both handles crossed over each other, so that we can lock them.

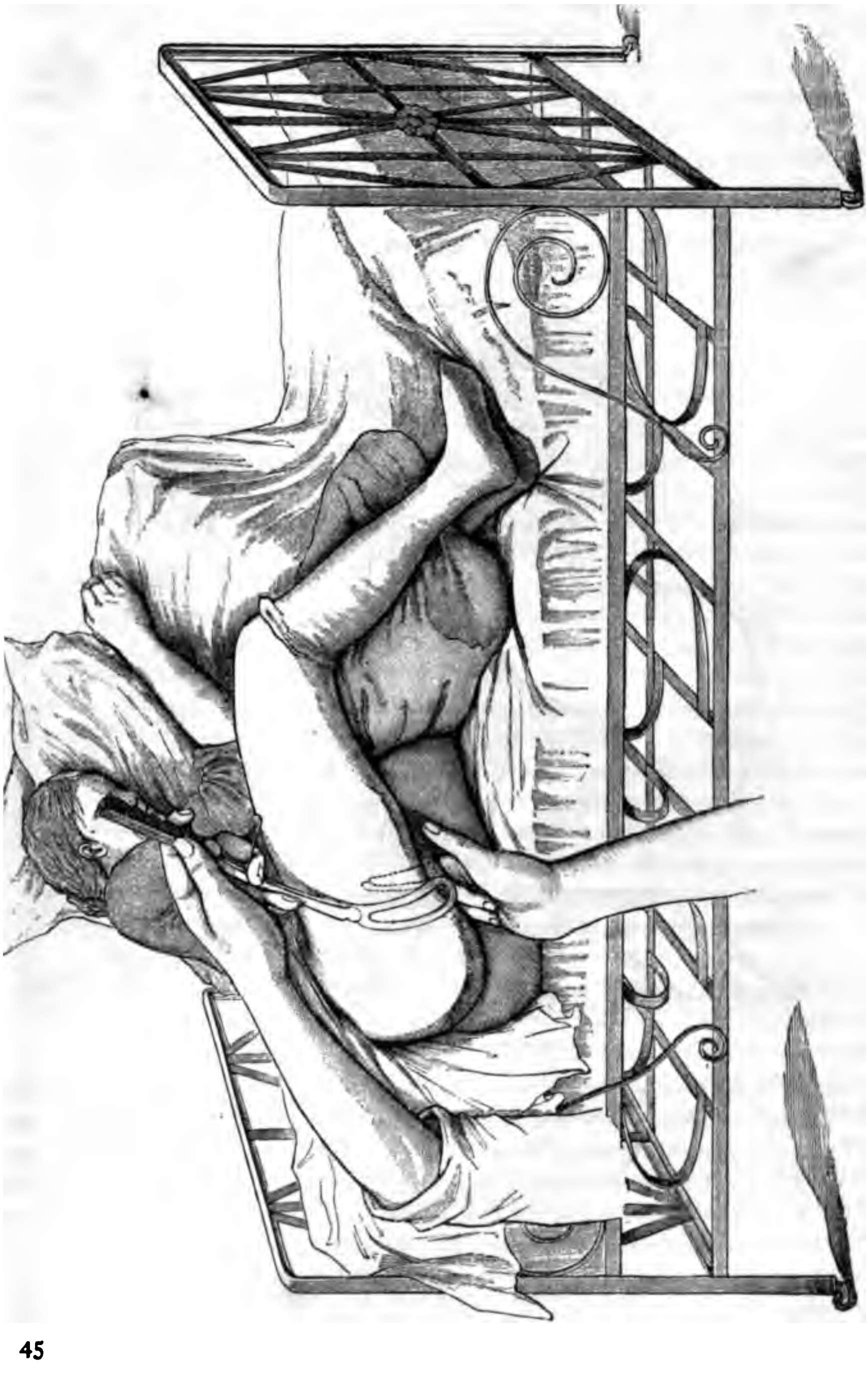
Extensive experience among those nations who employ the forceps in cases where the head is still very high and freely movable or where only a small segment of it has entered the pelvis, and in contracted pelves, with the head high up in the transverse diameter, has shown that the ordinary forceps are not suitable, because, with them, traction in the direction of the axis of the pelvic inlet is very difficult, and the head has not sufficient freedom of motion. A change has, therefore, been made in the forceps, which renders it possible to make traction directly upon the prolongation of the blades. Such forceps are called *axis-traction forceps*. Hubert (father and son), of Brussels, first recommended them. Tarnier has constructed several different patterns, and besides these Alexander R. Simpson has devised such a pair of forceps. Breus has recently devised a very handy instrument which is preferable to all the others, because of its lightness and the facility with which it can be applied; having tried it often, I most heartily recommend it (Fig. 159).

FIG. 159.



Breus' axis-traction forceps. Separation of the blades (Author's modification). *b*, transverse projection; *b'* to rest upon *b*; *a*, hook; *c*, head of spring to be pressed.

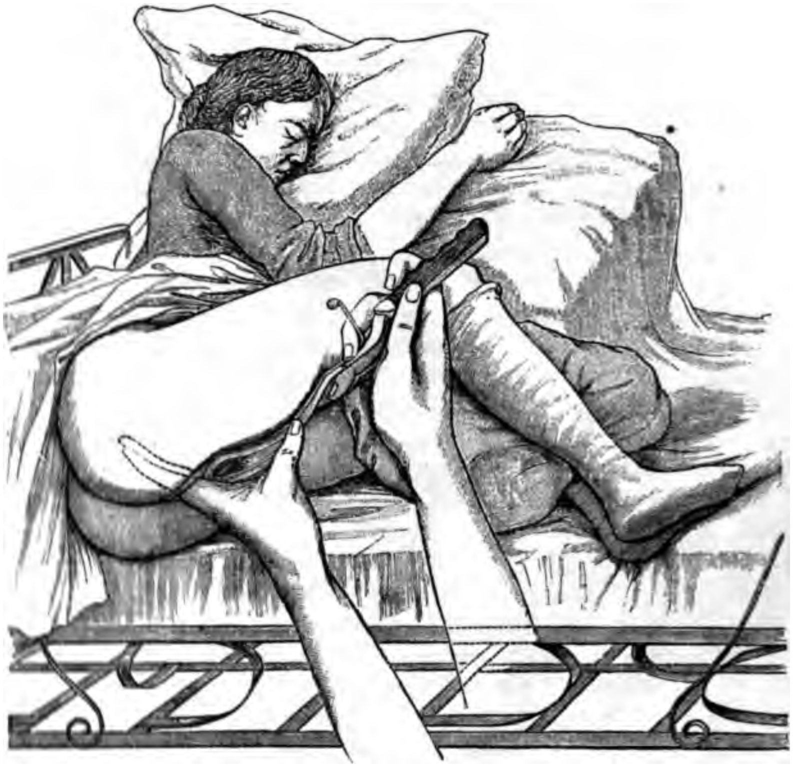
In Germany these attempts have been deprecated by some authors. As an example, I mention Litzmann alone, who considers them unnecessary, because the application of the forceps to a head which is still high up, is scarcely ever done by us. Yet it must be said that, in these cases, it is possible at times to draw the head with ease and rapidity down into the pelvis and extract with Breus' forceps. They are applied like the ordinary forceps; the handles, with their upright projections, are grasped in the same manner. A pin is passed through the holes at the ends of the uprights to hold the blades parallel, and the position of the steel bars to the hands indicates the direction in which traction is to be made. The advantage of Breus' forceps over those of Tarnier and A. R. Simpson, besides those mentioned above, consist in that traction is made directly on the handles. If the head stands high in the pelvis, and we pull it out of the pelvic inlet, the parturient being in the lateral prone position, the correct direction of the forceps is, I may almost say,



Application of the left blade of the forceps in the left lateral prone position.

guaranteed by the position, in that we hold the forceps turned directly toward us, and we lose none of the force which is applied. At the same time, the axis-traction forceps of Breus have still another advantage, that, through the elimination of the pelvic curve of the instrument the danger of injuring soft parts on the anterior pelvic wall, which exists with the ordinary forceps is completely avoided, and I can thus give the preference to Breus' instrument over the others, even for the lateral prone position.

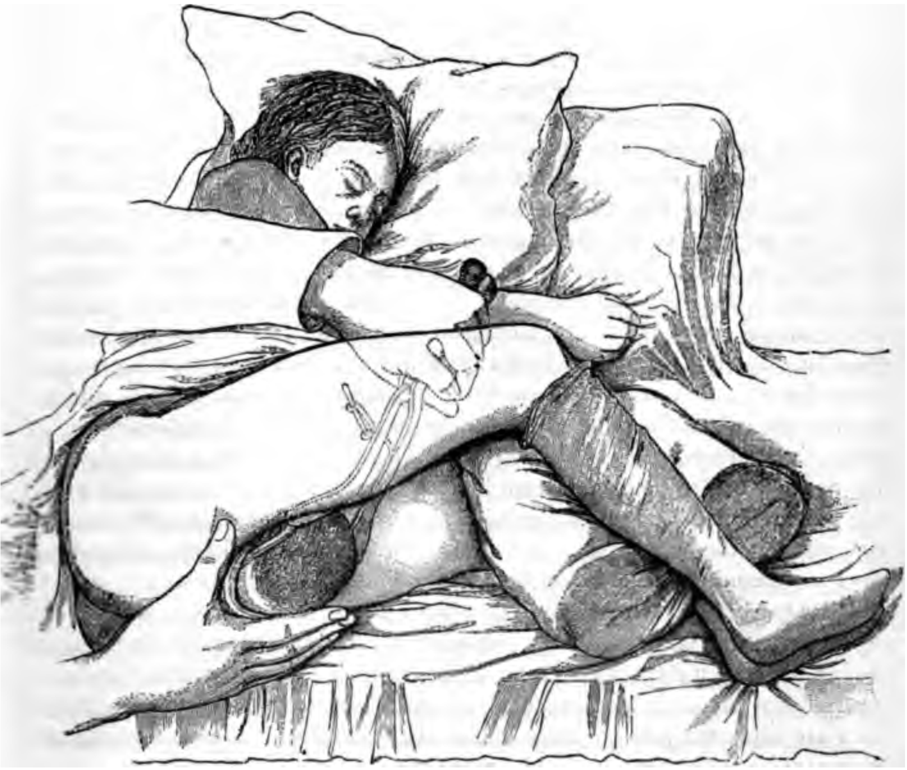
FIG. 161.



Application of the right blade of the forceps.

IV. *Application of the Forceps in the Lateral Prone Position of the Parturient.*—The woman's pelvis is brought to the edge of the bed and a pillow placed between the flexed knees. The operator stands behind the patient, and in the left lateral prone position first passes the right hand in front of the left synchondrosis, places the left blade perpendicularly on the right hand (Fig. 160), and advances it, with due regard for the head and pelvic curves, the handle being slowly lowered and finally pressed sideway against the perineum when the head is high up. He then carries the left hand, in like manner, in front of the synchondrosis on the upper right side of the woman, and places the right blade flat on this hand, so that the point of the handle comes between the patient's thighs. This blade is, in like manner, passed up by moving the handle from right to left, and finally pressing it against the perineum; the instrument is then locked. The turning or rotation of each blade is just the same as in the dorsal position. In the right lateral prone position of the parturient he introduces the left blade as described above for the right, and the right as the left. The extraction is done thus: We draw the head toward us, holding the handles with the right hand, while we make counter-pressure with the left against the upper trochanter, thereby fixing the patient. When the head is well down, we bring the handles toward the patient's thighs and, as it is about to emerge, we place one hand (in the left position the right, and *vice versa*) on the perineum, grasp the forceps at the lock with the other between the thighs and then extract very slowly (Fig. 162).

FIG. 162.



The emergence of the head and protection of the perineum in the lateral position.

The lateral position is specially to be recommended in difficult forceps operations, where we require all of our force; also in contracted pelvis, especially with a prominent anterior pelvic wall, where we must make traction for a long time in the first position; and, finally, in the absence of reliable assistants it cannot be surpassed. If the operator has any difficulty in adjusting the forceps in the lateral position, he can apply them in the dorsal decubitus and then turn the patient on the side. If the forceps do not grasp the head properly, whether applied in the lithotomy position or in the cross-bed position or on the side, or if the obstacle is too great for the head, or if the operator passes too quickly with his traction from one direction to another, the forceps will slip. This occurs suddenly and in a vertical direction, if he is making powerful traction and the cranial bones yield. If the direction of his traction is false, in so far that the handles are elevated too soon, the blades slip first horizontally along the head, the handles come closer and closer together, and finally they also slip vertically off. The appearance of one fenestra, when the head is high up, is the commencement of the vertical, the diminution of the distance between the handles a proof of the horizontal slipping of the instrument. In either case the forceps must be removed and reapplied. This must also be done if the blades are separated so far, in the first attempt to lock them, that we can appreciate from this separation that the child's head has not been grasped in its transverse diameter. If the blades, with the descent of the child's head, rotate so that one is near the pubic arch and the other near the perineum, we unfasten the instrument, first raise the posterior blade more to the side and lower the anterior one so that the forceps lie in the transverse diameter of the pelvic inlet. Otherwise both blades will cause extensive lacerations, the upper one injuring the parts around the urethra and clitoris; and this latter also prevents the normal rotation of the occiput under the symphysis.

V. *Application of the Forceps to the After-coming Head.*—This is best done in the cross-bed position. It is customary to apply them under the child's body; only when there is a scarcity of assistants, or their introduction underneath offers any particular difficulty, should they be introduced above; then they are depressed past the body and locked underneath. We consider them indicated only in those cases in which the mouth cannot be reached, the occiput is directed posteriorly, and the face remains stationary under the symphysis.

In applying the left blade, an assistant draws the child's body to the right side and over the right thigh; in introducing the right, to the left and above. It should be borne in mind, during the extraction, that the head is still high and at the pelvic inlet; therefore, we must draw a considerable time and forcibly in the first position, and only cease when the occiput becomes visible; then proceed slowly with the second and third positions, and carefully protect the perineum while the brow emerges. The body of the child is held continually by the assistant.

We shall now consider—

The Dangers of the Forceps Operation.—Among these are to be especially mentioned—

(*a*) *Lacerations of the uterus*, particularly the cervix. If the forceps are applied before the cervix is fully dilated, lacerations are often caused by slipping of the instrument. Deep incisions into the lips of the os are produced by the four sharp edges of the blades in the extraction of the head. Such a case I have published (*Berliner klin. Wochenschrift*, 1864, No. 9, Case 4). The vault of the vagina or the cervix may be perforated by forcibly introducing the blades.

(*b*) *Lacerations of the vagina.* Incisions into the walls of the vagina are produced if the forceps are obliquely applied or if traction is not properly made. Since the vaginal secretion lodges in such wounds of the posterior or lateral walls of the vagina and undergoes decomposition, the result is often the formation of abscesses and vesico- and recto-vaginal fistulæ.

(*c*) *Lacerations of the external genitals*, especially of the perineum, as well as of the tissue between the urethra and clitoris. These result from a too rapid extraction of the head. Not alone are the maternal soft parts frequently injured, but also the joints. The symphysis and sacro-iliac synchondroses have been stretched, distorted and ruptured, the coccyx has been fractured, and even fractures of the bones of the pelvis have occurred. (For the literature, see Part VII, 3, Chap. II.)

On the part of the child, the lightest form of injury is a reddening of the skin over the places where the points of the blades rested; the second degree is an excoriation of the skin; and the third, a cutting through of the skin down to the bone. We observe the latter over one eye if the head has been grasped very obliquely or antero-posteriorly. Besides these, depressions and fissures of one of the bones, the parietal or frontal, occur. (See Fig. 116, page 489.) We can frequently distinguish these cephalhæmatomata during the delivery, more especially if we are called to a woman on whom another operator has worked in vain with the forceps. The impressions may disappear after some time and the pressure sores heal up; many, however, remain, and the head is deformed for life. Moderate pressure, with only a little reddening of the skin, causes very frequently a paralysis of the facial nerve, which disappears spontaneously in most cases, after a short time. Pressure on the brachial plexus, with gangrene over the outer border of the trapezius muscle and paralysis of the corresponding arm, has likewise been reported (*Stahl-Hegar*, *l. c.*, page 142). I have given a course in operative obstetrics to a physician twenty-five years of age, who was himself delivered with the forceps, and had a depression on the brow over one eye, in the neighborhood of which the skin was moderately pigmented, apparently from a simultaneous hemorrhage into the cellular tissues.

Enough! The forceps in the hands of a skilled operator is by no means a harmless instrument; how much more damage may it cause in the hands of an unskilled physician! That it does so frequently, no one has better opportunities of observing than we hospital attendants, who are kept busy with perineal lacerations, fistulæ, cicatrices of the vagina, ectropion of the cervix, fixation of the uterus, etc., the result of such operations, and which necessitate the patients submitting to operations year after year, alas, often in vain, and they have only the physician to thank for all their sufferings, because of his impatience. If we were to admit the forceps as an "operation of convenience," or were to teach our pupils this, we should be wanting in conscience, since it requires no proof to show that we cannot send all out as masters of the art.

It is much to be regretted that the pernicious teachings of Osiander, the father, are not yet banished from the heads of German obstetricians. Example: each midwife in Saxony has one-half of her patients delivered artificially by physicians ("Berichte und Studien," III, p. 373), and in other countries the proportions are undoubtedly the same, only the supervision of the midwives is not as thorough.

As an illustration of what has been said, and in order to present a registration of our own mistakes, I will choose a period of five years during which time stringent antisepsis was practiced in my clinic at Dresden, namely, from 1879–1883, and in which the number of internes was always a considerable one. Since these operated frequently in my presence or in that of the assistants, and, as is to be shown, the forceps were used only when the indications were well marked, the conditions, as regards skill in operative interference, approximate somewhat those in private practice. Yet this was not wholly the case, for good assistants were always at hand for the hospitals; if the first operator did not master the difficulty, the more experienced one took his place, and these selected physicians, who came as internes into the hospital, had a heightened interest in obstetrics, and in part had already a greater experience than those practicing physicians who pursue obstetrics along with the other branches of medicine. During this time only 184 forceps operations occurred in more than 5000 labors, just 3 per cent., a figure which is small as compared with those of many hospitals, and proof that the indications were always well marked. Two among them were for the after-coming head (both were done during my absence), besides one for a breech presentation (also during my absence); this latter was caused apparently by an error in diagnosis on the part of the assistant and the internes.

Let us turn our attention first to the indications, and there appears on the one hand the large number of primiparæ (117) to the pluriparæ (II to Vparæ, 54) and multiparæ (10). while the relative proportion of both was about alike in Dresden, and on the other hand, the very large number of elderly primiparæ (over 30 years, 17).

The relation of the indications arising from the mother to those arising from the child was 52 : 108; jeopardy of the child's life compelled us to have recourse to the forceps just twice as often as that of the mother's: seven times the cord was prolapsed and twice an arm, in these 108 cases. On the part of the mother the indications embraced 23 cases of diseases (fever, Bright's and heart disease, collapse), 13 cases of eclampsia, and very often bruising of the soft parts, since many different forms of contracted pelvis occurred among the 184 cases. The forceps were used twice for collapse, the result of impending or actual rupture of the uterus. Bearing all this in mind, the death rate, at first sight, would not appear very high, for only 11 or 5.9 per cent. died of the 184 women, of whom more than one-quarter were in danger at the time of delivery.

If we examine more closely into the causes of death, we see at once that the mortality was much too high because of the fault of the operator; four died of infection alone, two of eclampsia with infection, three of ruptured uterus, one of hemorrhage and one of pernicious anæmia. One-half of the cases of infection and 1 or 2 cases of rupture could, perhaps, have been avoided.

Of injuries to the mother there are recorded forty-four of lacerated perineum, five lacerations of the vagina, three deep lacerations under the clitoris, one rupture of varicose veins, and two lacerations of the cervix which had to be sutured. The perineal lacerations during the use of the forceps were produced not only more frequently than in normal deliveries, but were much deeper and longer; some of them required as many as ten sutures, and all forty-four an average of four. At the same time there were four pluriparæ and almost all the old primiparæ among the forty-four; there were also fifteen children with occipito-posterior position, two in face and one in breech position, whereby the predisposition to the occurrence of a laceration was increased; in spite of all this, an average of four sutures is a very large number. Three of these forty-four mothers were among those who died, with five, four and one sutures respectively.

The other diseases of the mother, which were not fatal, were parametritis, six cases; phlegmasia alba dolens, one; peritonitis, one; partial gangrene of the vulva, two; incontinence of urine, one; and lesion of the symphysis after application of forceps to second occipito-posterior position in an obliquely contracted pelvis (from coxitis), central rupture with a child who weighed 3390 gm., and sixty of those delivered with the forceps were detained over the customary time (10–11 days), some of them as long as sixty days, until their complete recovery.

As regards the fœtal mortality, it is to be noted that the forceps were twice unsuccessful, and it was necessary to perforate. There remain then, leaving these out, 182 children who were brought into the world with the forceps; 23 of these, or 12.6 per cent., died during delivery, and 14, or 7.7 per cent., within the first ten days. The total mortality was 20.3 per cent., or twice as much as in ordinary cases; this is a figure which is satisfactory. Some of the causes of death were hæmatoma of the dura mater (death on the eighth day); apoplexia cerebri (death on the seventh day, and one after living six hours). Two died after eclampsia of the mother, and one from placenta prævia.

Facial paralysis was observed eight times; fracture of the occipital bone once (the child died on the twelfth day), and, finally, I have myself, after extracting with the forceps the head of a child whose weight was 3800 gm. fractured the right clavicle during the delivery of the thorax which was greatly developed.

Of the diseases which were the result of the operation, I have once observed an abscess on the left parietal bone, and once a suppuration of a contusion.

In conclusion, I would relate a case of a first face position, with the chin posterior, in which I rotated the chin forward, and delivered a very large child, 52 cm. long, and 3950 gm. in weight; the mother and child left the hospital on the eleventh day; also, another case of second face position, in which the child weighed 3740 gm., mother and child leaving the hospital on the tenth day.

Our results in Munich are decidedly better, since the use of sublimate as an antiseptic; in four years we were obliged to use the forceps eighty-seven times in 3500 births, 2.49 per cent. of all the deliveries; only one of the women died = 1.15 per cent.; fifteen of the children, or 17.2 per cent., were still-born, but two of them were already macerated; there remain then 13, or 15 per cent.

Appendix.—The lever (*vectis*), or, which answers the same purpose, one blade of the forceps, is now very seldom used in Germany for forward rotation of the occiput, brow or face. In America, Dewees and Hodge have used it much, and recommended it both for rotating the child's head about the vertical and about the transverse diameter, when the head presents, as well as for the after-coming head; they have even used it as a means of traction when provided with a marked cephalic curve. Whether the hand or the pelvic wall is used as a fulcrum for this purpose, the instrument slips very easily, is under no circumstance suitable for traction, and, as a means of improving the position, has no advantages over the forceps; for which reasons it is safe to predict that, in future, it will have a limited application in America or anywhere else.

CHAPTER V.

The Extraction of the Head, Reduced in Size, after Perforation, Decapitation and Eventration, with the Cranioclast, Cranial Forceps and Hook.

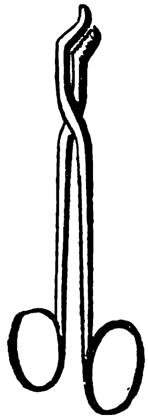
1. The precursor of cranioclasis as it is performed to-day, was the extraction of the perforated head with a special forceps (Fig. 163), devised by Jacques Mesnard, 1753.

I had already called attention, in 1860, to the excellence of this instrument and its prospective improvement (*Monatsschr. f. Geburtsk.*, XVII, 292), when Simpson, about the same time, altered Mesnard's forceps in such a manner as to separate it into two arms crossing each other, one of which, for the inner surface of the skull, was convex, non-fenestrated and provided with two rows of deep ribs parallel with each other; the other, for the outer cranial surface, was fenestrated, concave and ribbed on the borders of the opening to correspond with the former. Simpson, however, did not improve on Mesnard's idea, since he used his forceps for fracturing and removing the several bones of the skull, hence only for the purpose of diminishing the size of the skull, not for its extraction.

C. v. Braun applied Cohen's compression apparatus to the end of Simpson's cranioclast and lengthened the instrument (Fig. 164), and thus was the first to convert it into an extraction instrument, a craniotractor, since which time it has come into use throughout Germany. My father improved Mesnard's instrument by making the grasping surface wider and broader, and by rendering it possible to fasten the ends of the handles together by means of a catch and a notched metal plate (Fig. 165). The small cranioclast of A. Auvard (Fig. 166) is very similar to this instrument, and was described in 1884. A larger cranioclast of A. Auvard is employed in the manner which is clearly shown in Figs. 167 and 168. The arms are applied in the first position for compression, and in the second for extraction of the skull.

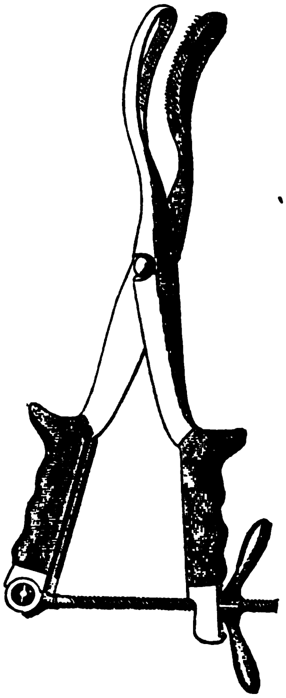
Extraction with the cranioclast can be performed in multiparæ in the half or the whole cross-bed position without anæsthesia; in primiparæ chloroform must be administered. It is indicated as the most desirable, least dangerous and simplest extraction after a perforation. It is most reliable because the bones and soft parts of the skull, being so firmly compressed, can be drawn upon and elongated in a manner which no other instrument permits; the very grasp of the soft parts with the bones prevents most certainly the tearing out of the latter, and gives the instrument its best hold. It is least dangerous because the maternal soft parts are best spared by it, and because of its broad and long grasping surface, the instrument does not slip so easily as the hook and the cephalotribe. And it is simplest because the introduction of the blades requires that the half-hand should be introduced only once; further, because the blade which is to be inserted into

FIG. 163.



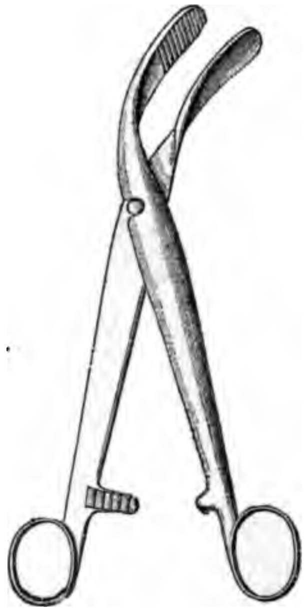
Mesnard's Bone Forceps (1753).

FIG. 164.



Cranioclast of C. V. Braun (reduced size).

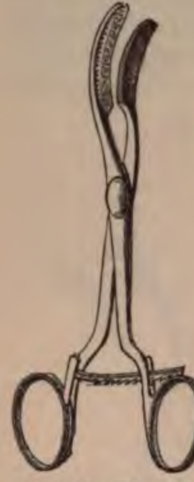
FIG. 165.



Mesnard's Forceps, improved by my father.

the skull can encounter no difficulties if the perforation is large enough; and finally, because the covering of sharp projecting pieces of bone, and of the external blade, which takes up much less room, is safer than in the case of other instruments. I cannot understand how any one can recommend to an unskilled physician, just going into practice, the cephalotribe as an instrument for extracting after perforation instead of the cranioclast, because he is equipping him with a much more dangerous instrument. If any one objects that the base of the skull cannot be so thoroughly reduced in size with the cranioclast as with the cephalotribe, I would reply that we can remove with it each separate bone to the vertebral column with ease, and that then it is often possible to extract the body by the soft parts alone. I consider the broad, non-fenestrated, serrated blades better than the fenestration of one blade, because with the latter the bones and soft parts fracture and rupture sooner than, and are not held as securely as, between two solid blades. I have frequently been obliged to exchange the cranioclast for Mesnard's forceps, and with this have quickly completed the extraction.

FIG. 166.



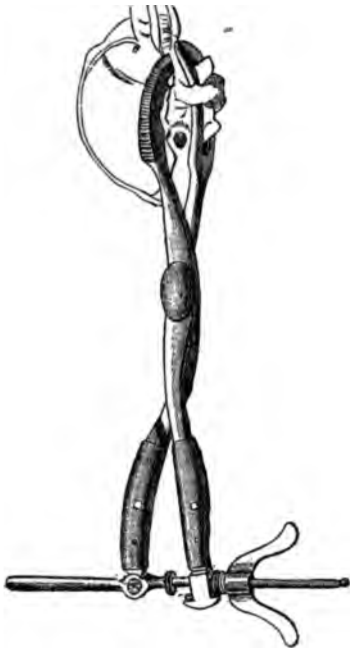
Small Cranioclast of A. Auvard (Paris).

The length of the whole instrument should be 37 cm.; its blades, 15 cm. long and 2.2 cm. broad; the lock per contabulationem (English pattern), or per axin (simplified French); the handles, with transverse projections, 12 cm. long; the compression-apparatus should be at the end of the handles.

The instrument is applied as follows: When the head is high, four fingers are introduced and grasp the spot where the external blade is to rest; the best place is to the left or right of the promontory posteriorly, as in the case of the ordinary forceps. This blade is carried up on the hand above the base of the skull. While the little finger of the hand in the vagina holds this blade, the non-fenestrated one is passed through the perforation to the base of the skull; each blade is then grasped by the hand corresponding to it, and the lock is fastened; the locking is the only difficulty. The compression-apparatus is then placed in position and slowly screwed up; the bones are not to be fractured, but only to be grasped as firmly as possible.

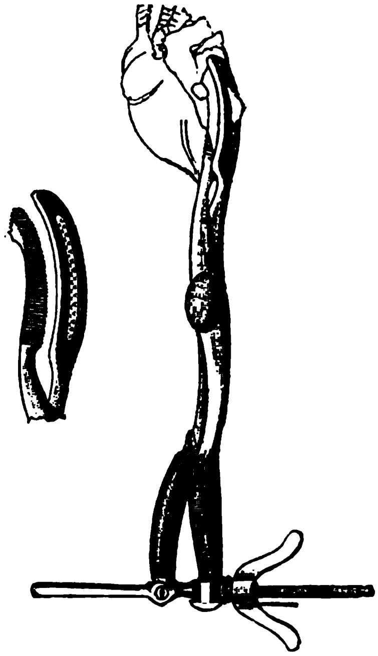
The extraction commences as soon as we are convinced that the instrument is in good position and the head is securely grasped. The left hand in the vagina covers the cranial opening, and the right makes traction with the instrument and, at the same time, turns it round like a screw, as if pulling a cork. Thereby the accommodation of the reduced head to the pelvic inlet is made easier, the traction is spread out over a greater extent of the soft parts, and the instrument does not easily tear away. If the latter does

FIG. 167.



Large Cranioclast of Auvard. First Position for crushing.

FIG. 168.

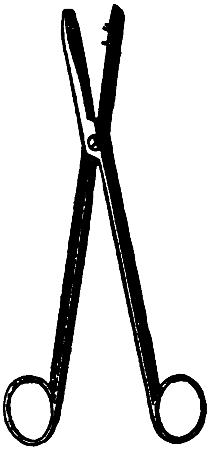


Large Cranioclast of Auvard. Second Position for the extraction.

occur, we remove the loosened bones with bone forceps (Fig. 169) and grasp the head over another part. Whether the occiput, brow or face is deepest, we always select that part by which we believe the extraction can most surely be completed. We make downward traction until the head is visible, and then raise the instrument upward in a circle, like the forceps. The instrument is removed after the trunk is delivered, for the shoulders, too, can be extracted by means of the head. It is also much better to apply the cranioclast to the perforated after-coming head for extraction than the cephalotribe. The external blade rests over the temples or the brow of the child, and the operator, by reason of the easier manipulation of the instrument, can bring the head with ease through the small pelvis, turning it in the manner which seems to him best.

Statistics of the *results of cranioclasis* are difficult to give. The operation, in itself, is free from danger, and lacerations of the soft parts can almost certainly be avoided; it is, therefore, the conditions that indicate the

FIG. 169.



Bone forceps.

perforation and cranioclasis upon which the result of this operation depends: contusion, tearing and stretching of the soft parts, the degree of the pelvic contraction, and the previous attempts at operations with the forceps, cephalotribe, hand or the hook. I shall attempt to separate the simple and complicated cases from each other, in order to make a comparison of the results of the first-named operation with those of the cephalotribe and the hook on the basis of the mortality and morbidity. I would remark, in passing, that a large proportion of these operations were not done by me, but by the assistants or internes, under my supervision or in my absence.

Among 52 perforations and cases of cranioclasis which occurred in 6000 deliveries, from 1879–1885, there were 25 primiparæ and 27 multiparæ, almost equally divided. Of course, the most frequent indication was contracted pelvis of a marked type, which becomes more momentous with each labor. The danger of injury to the soft part, so frequent in contracted pelves, viz., the distention of the lower segment of the uterus predisposing to rupture of the uterus, must suggest itself as the most frequent cause of death; this occurred seven times in the 52 cases, once with hydrocephalus, four times as a laceration, twice as a perforating contusion (the first four terminated fatally in from three to twenty-two hours, the last two on the eleventh day). Once a rupture of the vagina occurred, with œdema of vulva and vagina and nephritis—fatal result. Four puerperæ died of infection, one after artificial detachment of the placenta, and one died of eclampsia of Bright's disease, with pachymeningitis hemorrhagica. Altogether, thirteen, or 25 per cent., of these cases died: 15.3 per cent. of ruptured uterus, 7.7 per cent. of infection, and 2 per cent. of intercurrent diseases. Either the forceps (six times) or the reposition of the cord (once) had been vainly attempted on seven out of the thirteen who died. The operation was performed six times on the after-coming head; of these, none died. We performed perforation and cranioclasis sixteen times in 3500 deliveries which were observed in Munich from 1883–1886, that is, only 0.46 per cent.; of these, two mothers were lost = 12.5 per cent.; both died of peritonitis, in spite of disinfection with sublimate.

FIG. 170.

Double hook.

2. Extraction of the perforated head with a *sharp hook* (Fig. 170) has no advantages over the cranioclast or the improved Mesnard's forceps; on the contrary, it has many disadvantages. The latter are: The small surface to which it is attached and, therefore, greater liability to tear out, and the difficulty of firm insertion. Gusserow is the most ardent supporter of this form of extraction.

3. The *extraction of the decapitated child* begins by drawing down the body by the axilla or by the arms. As a rule, this is not particularly difficult. As soon as the body is born, the assistant presses the head, most suitably the basis cranii, from without into the pelvis by grasping and elevating the occiput and depressing the forehead. The operator introduces the hand corresponding to the child's face, and passes two fingers into the mouth, and, while using them for moderate traction on the head, he applies

powerful pressure upon the head through the body of the uterus, in order to express it. If this, the simplest procedure, does not succeed, he may then introduce the blades of the cranioclast, and seize the lower jaw with the soft parts about the neck. If the pelvis is so much contracted that the head cannot be extracted entire, it is perforated through one of the lateral fontanelles, the head being steadied from above, and extracted with the cranioclast in the same manner as the after-coming head, when still attached to the body.

4. *After eventration* the extraction of the child may be done in different ways: (*a*) We pass a sharp hook through the opening and seek to fasten it in the fœtal pelvis in order to draw down the breech, and by it extract the body, or (*b*) we hook Braun's blunt hook over the vertebræ and try to fracture these by traction, so that the child is drawn down as in conduplicatio corpore (spontaneous evolution) and then extracted (*Michaelis*), or (*c*) we divide the body, including the vertebræ, in two with a blunt-pointed pair of scissors, and draw out first the lower and then the upper half (*Simpson*). Here, also, we can use the cranioclast to advantage because of the firm hold that it takes on the fœtal parts; finally (*d*), if the removal of the internal organs allows enough space, we can proceed along the fœtal body and bring down a foot, in order to extract by this, provided the lower uterine segment is not distended too much, and the body of the uterus is not contracted too firmly. The methods (*a*) and (*b*) are used most frequently; (*d*) is least often employed.

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(2) The delivery of the child through artificial passages.

CHAPTER VI.

Abdominal Incision. Laparotomy.

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Simple incision of the abdomen as an obstetric operation may be necessary, either during pregnancy or the delivery; in the former, if the fœtus has escaped through some injury from the cavity of the uterus, or if from the commencement it was imbedded outside of the uterus. During labor, likewise, if the fœtus cannot be delivered by the natural passages, or has escaped into the abdomen. Tubal, ovarian and abdominal pregnancies, on the one hand, and rupture of the uterus, with escape of the fœtus, on the other, are the indications for it.

Although the indication in rupture of the uterus is rather simple, and laparotomy is, at all events, indicated as soon as the child has passed, for the most part, through the laceration into the abdomen, it is somewhat more difficult to establish the indications for laparotomy in extra-uterine pregnancy. Very many women, in whom an extra-uterine pregnancy has terminated in rupture of the sac and profuse hemorrhage, have recovered, under the diagnosis of retro-uterine hæmatocele; a considerable number, where the hemorrhage was marked and the diagnosis was surely established, have likewise got well without laparotomy. If a woman recovers, after a laparotomy for, say, ruptured tubal pregnancy, who will positively affirm that she could have recovered in no other way? If we assume that the blood lost up to the commencement of the operation would have been sufficient to almost certainly cause death, is not an additional quantity of blood lost during the operation, and is not a certain amount of vital force taken away from the woman by removing the blood-clots from the abdomen, which force we try to impart to extremely anæmic persons in this way (peritoneal transfusion)?

Furthermore, the means which cause the destruction of the fœtus in the earlier months and promote its absorption, have not, as yet, been properly appreciated; they are absolutely free from danger, they are certain in their action and can be employed up to the middle of pregnancy, even repeatedly in the same woman.

I consider laparotomy to be indicated in extra-uterine pregnancy, if the child is living and nearly at full term; also, if the child is dead and over seven months old, as soon as nature appears to be making an effort to expel it, as indicated by fever, tenderness of the sac, distention of the abdomen, etc. Before the seventh month, the fœtal parts are more easily separated from their attachments, and can be discharged through the bowel, vagina or abdominal wall without the openings being too large, so that we need only facilitate this perforation, but not, under all circumstances, do a laparotomy.

(*a*) *Laparotomy in Extra-uterine Pregnancy—Preparations for the Operation.*—If we feel compelled to perform an immediate laparotomy, because of a well-marked peritoneal hemorrhage, the question arises, Shall we administer chloroform or not? Most of the recent operators do. Under any circumstances, we should lay the patient's head as low as possible, wrap the extremities in warm cloths, and, if the abdomen were not stretched too much, we could attempt to compress the descending aorta. Ether must be at hand to be given hypodermatically during the operation. The instruments must be close at hand, lying in a 3-per-cent. carbolic solution. We require an ordinary scalpel, tenacula, thumb forceps, grooved director, Helferich's screw-clamp, pedicle forceps, transfixion needles, scissors, straight and curved on the flat, and the Pacquelin cautery. Then the abdominal wall is made aseptic; the mons veneris is shaved, the skin scrubbed with 1-per-cent. sublimate solution, and then washed with alcohol; towels wrung out in sublimate solution are then spread out above the navel and below the symphysis. We cut through the skin in the median line, divide the subcutaneous fat and fascia; as soon as the muscle is visible, we draw it to the right and left to find the notch between the two recti; here we cut through the fascia and the præperitoneal fat, seize the peritoneum which bulges forward with a pair of toothed forceps to cut it, and then with a grooved director make the opening in the peritoneum as long as that of the external skin (8–10 cm.). Bleeding vessels are at once ligated with catgut, or twisted.

After opening the abdomen, part of the escaped blood will flow out; we must then proceed quickly, with two or four fingers, to compress the bleeding point, the locality of which we may infer by palpation: if one tube has burst, we secure the isthmus of the tube with a Helferich's clamp, scoop out the tumor from the tube, pass a ligature around the bleeding vessels, so that we may then tie off the entire fœtus with its sac and cut them out. As soon as this is done, we sew the peritoneum over the pedicle, loosen the clamp, and convince ourselves that not one drop of blood escapes from the stump; then clear the abdominal cavity and Douglas' cul-de-sac of all clots and fluids by means of warm, carbolized sponges, and finally close the abdomen with silkworm-gut sutures, which are inserted through the entire thickness of the abdominal wall, about 1.5–2 cm. apart. For a dressing, we lay some iodoform gauze over the wound, over this some salicylic cotton, and apply a gauze or elastic bandage to compress the abdomen.

In a ruptured *ovarian pregnancy*, and in a case of pregnancy occurring in an atretic horn of the uterus, we would proceed in like manner; prepare the stump of the tumor and ligate it separately.

The case is entirely different, however, if we have to deal with a case of *abdominal pregnancy*. Here it is impossible to remove the sac in its entirety without causing very dangerous lacerations of the neighboring organs or a fatal hemorrhage. Besides this, there is the danger of allowing the liquor amnii, mixed with vernix caseosa and meconium, to flow into the abdominal cavity, by reason of the varying thickness of the sac-wall. To prevent this we must place the patient during the operation in a half-sitting position, the incision through the peritoneum must be made with the greatest care, and finally, the resisting points of the sac must be sewed to the abdominal wall, especially to the parietal peritoneum. After thoroughly opening the sac, the child is extracted, the navel string cut, and a long band is attached to the placental end of the cord, so that it cannot slip back. If the child is already macerated, the placenta can be loosened from the sac-wall and in like manner removed. If the child is alive, or is dead only a short time, we must leave the placenta intact and allow nature to throw it off. If the attachment of the placenta is in Douglas' pouch, so that it would be difficult to drain through the abdominal wall, we may incise the sac through the vault of the vagina, and introduce a thick glass drain through it, by means of which we can irrigate the cavity from the abdominal wound several times a day with a 1–2 per cent. solution of carbolic acid. The tube must project beyond the edge of the wound above and outside of the vagina below, and salicylic or iodoform gauze must be wrapped around each end; it must form a segment of a circle and must have numerous openings, whose edges are not sharp.

If, however, the sac is entirely above the small pelvis, it suffices to drain it through the abdominal wound with several glass drains, which are to be removed when the placenta is discharged and the secretion from the cavity is entirely odorless, and has almost entirely disappeared, which is not to be expected in less than 12–16 days. K. Schröder and others have used permanent irrigation of the sac with success, in cases where the drainage was through the wound and vagina, by binding to the upper end of the drain an irrigator with a dropping apparatus, and carrying the lower end into a vessel between the legs of the puerpera.

Very exceptionally (*Schreyer* and others) the placenta is attached to a point within easy reach and readily compressible, so that it has been possible, in the case of living children, to separate the placenta from its attachment, to control the hemorrhage by styptics (liquor ferri sesquichloridi) and compression or by partially surrounding with ligatures the vessels within reach, and to save the patient.

Finally, the question to be answered would be, whether it were not better, if a vaginal douche be used, to close the abdominal wound entirely, and to irrigate through the vagina alone, thus shutting out any possibility of the entrance of poisonous germs from one side. This question is by no means settled as yet. We might consider drainage per vaginam completely satisfactory if the genitals are large and wide, and the vaginal opening is wide and easily passable; in the case of a narrow vagina and a small opening through which it is difficult to pass, it is otherwise.

(*b*) *Laparotomy for ruptured uterus with the escape of a portion or the whole of the fœtus.*—The conditions required to justify the operation are that the woman be not moribund and that the extraction of the fœtus by the natural passages is either impossible or far more dangerous than laparotomy. In the case of pregnant women it is usually ruptured cicatrices of a Cæsarean section which furnish this indication, since the escape of the entire fœtus usually follows the rupture and the cervix is tightly closed and not prepared for the delivery; less often it is the rupture of a pregnant horn of the uterus. In parturient women it is a perforating contusion or a laceration of the cervix, with the escape of the head or whole child; very rarely the placenta with the cord is expelled into the abdominal cavity from a firmly closed uterus, after the entire child has been extracted by the natural passages. I have once operated under these circumstances, but the placenta was not found; the physician who brought us the half-delivered woman asserted positively that he had felt it slip into the abdomen. He claimed to have attempted to remove it through the uterine wound, but in vain, it could no longer be felt. The autopsy revealed the peritoneum torn in front and beside the vertebræ; the placenta had been pushed into a retroperitoneal pocket (!). Abdominal section performed in such cases is the same as above described. If, after opening the abdomen, we see the whole ovum with membranes intact, as I have observed it with my father, we must take pains to remove it without any laceration or, at least, to extract it through the wound in such a way that the liquor amnii escapes entirely outside.

We then cleanse the abdomen from blood, search for the tear in the uterus, note if there is any hemorrhage from it, smooth the edges of the wound and approximate first the decidua and the muscular part of the wall with fine, strong silk, and over this unite the peritoneal edges. Cases of ruptured Cæsarean cicatrices, which are poorly supplied with blood-vessels, have repeatedly recovered after sewing up the ruptured part.

It should be borne in mind, especially in the latter case where the cervix is not passable, to open it from above, in order to allow the lochia to escape by the natural passages.

If the head of the child is still in the uterus, while the body, up to the neck, has escaped through the wound, the extraction of the head from a firmly contracted uterus may offer great difficulties. Simple traction is ineffectual, the introduction of one and finally two hands through the tear renders the extraction possible, but the wound may thereby be considerably increased in size.

If the placenta remains still in the uterus, it should likewise be extracted through the abdominal wound. If the uterine tear is firmly closed and the laceration has occurred during delivery, its removal could be effected more safely for the half-delivered woman by passing a hand up through the vagina, than by forcing it through the wound.

CHAPTER VII.

The Abdomino-uterine Incision. Laparo-hysterotomy; Sectio Cæsarea.

Historical.—The Cæsarean section dates back almost one thousand years before the birth of Christ. Numa Pompilius (705) made a law about the excision of the fœtus from the abdomen of a dead pregnant woman. It read as follows: "Mulierem si prægnans mortua fuit, nisi exciso partu ne humato, qui secus faxit, quasi spem animantis peremerit, ita esto." It is now taught that this operation, in ancient times, was only performed on the dead, and the swine-gelder, Jacob Nufer, was the first to do it on a living woman. However, it is improbable that, if the idea of extracting a living child from a dead woman was so old, the other thought should not have suggested itself along with this, of delivering by the same means a living woman whose internal genitals were not passable, but whose abdomen contained a fully-developed child. If other operations, *e.g.*, internal version, were in disfavor for about fifteen hundred years, this could more easily be the case with the Cæsarean section on the living, because its fatal effects would certainly not encourage publication, but rather imposed silence on the operator. This view is strengthened by the considerable number of eminent men cited in ancient records as "cæsi e matris utero," and is more probable than the supposition that they were all extracted from the dead mother. The authors, from Celsus to Nufer, probably do not mention its performance on the living, because it occurred so seldom and was so regularly fatal that it was considered inadmissible and reprehensible, as was also the case in Paris until the most recent times. The men who deserve most credit for improving the operation are G. A. Michaelis, H. Wiefel, L. Winckel, E. Martin and Sänger; G. A. Michaelis, for defining the indications and performing the operation most carefully, even repeating it successfully on the same woman; Wiefel and L. Winckel, for the rules to facilitate the extraction of the child from the uterine wound; E. Martin, for sewing the uterus to the abdominal wall and suturing the wound; and, finally, Sänger, for introducing the best method of suturing, first with, then without resection of a piece of the muscular structure. Leopold has operated most frequently according to Sänger's method: twenty times in five thousand deliveries.

Indications.—(*a*) *On the Living.* (1) If absolute pelvic contraction renders delivery by the natural passages impossible, Cæsarean section is indicated when the child is fully developed, even if dead; (2) if tumors of the pelvic organs (myomata, ovarian tumors, echinococci, etc.) which cannot be reposited or diminished in size, make it impossible to deliver even the mutilated child through the genital canal, when the child is living or dead; (3) if such extreme cicatrization of the vault or the middle portion of the vagina is present, that the natural passage cannot be dilated without lacerating the neighboring organs, when the child is living or dead; (4) if the child is living, the pelvis contracted, or tumors and cicatrices are present, so that the child can only be delivered by mutilation, and the mother refuses to give her consent; pelvic contraction to the second or third degree, etc.; (5) if the child is living or dead, when the uterus is strangulated in a hernia and cannot be replaced.

(*b*) *On the dead pregnant woman,* if the child was alive shortly before the mother's death, if the latter occurred suddenly, and not more than twenty-five minutes have elapsed to the beginning of the operation, which, therefore will be performed mainly after apoplexy, eclampsia, or death from acute injury. It has been established by experiments on animals, and by operations on the dead, that the child can live twenty-five minutes after the death of the mother, and living children have been extracted within this time; for example, one such case occurred in my clinic at Dresden, under Dr. Osterloh. These children have, as a rule, been short-lived, because the accident which caused the mother's death had affected them likewise. There is little prospect of saving the child in chronic diseases, as tuberculosis, pneumonia, heart disease and Bright's.

J. Veit advises that only such cases be chosen for Cæsarean section in which the genital canal is surely aseptic, at least where the indication is relative; that is to say, substantially to employ it in place of the induction of premature labor.

The best time for the operation is in the middle or at the close of the first stage, if possible before the membranes are ruptured. The pains are then strong enough to relieve us of any fear of dangerous hemorrhage after the removal of the placenta, and the cervix offers no obstruction to the subsequent discharge of the lochia.

Performance of the Operation.—The preparation and *first step* are like those of an ordinary laparotomy (see page 719).

Second Step.—The uterus is rolled out, and an elastic ligature applied loosely below the level of the ovaries about the cervix, and the abdomen closed by preliminary sutures.

Third Step.—Opening of the uterus. The assistant places the uterus, which is turned on its long axis so that the middle of its anterior wall corresponds exactly with the abdominal incision, and fixes it so that it cannot slip. After cutting vertically through the peritoneum, the muscles are gradually separated until we reach the ovum. We can distinguish previously, by the distinctness with which the extremities can be made out, whether the placenta is attached in front or not. If this diagnosis is impossible, we can convince ourselves, according to the proposal of Halbertsma, by puncturing the uterine wall at the point selected for the incision, as to the situation of the placenta, and in this manner avoid it. After cutting through the decidua vera, and increasing the incision to a length sufficient for extracting the child, the assistant on the left side of the patient grasps the upper angle of the wound with the index finger of the right hand, holds this together with the abdominal wall, and similarly inserts the index finger of the left hand into the lower angle. By this manipulation the uterus is prevented from following down the child too rapidly and constricting any of the fœtal parts during the extraction; at the same time a prolapse of the intestines is avoided.

Fourth Step.—The membranes are then ruptured, and the operator prevents the too rapid escape of the waters by forcing his hand at once into the sac. He proceeds upward along the fœtal part first felt for the most part toward the breech, rolls this slowly out with the help of the external hand, while the inner one follows along the side and neck of the child, and passes around the head, which it grasps and draws slowly out of the wound. If the uterine wound is too small, it must be enlarged from within outward by a blunt-pointed bistoury upon the inner hand. As soon as the child cries he vigorously cuts the cord.

Fifth Step.—The assistant compresses the cervix until the operator, after cutting the funis, has firmly tightened the elastic ligature. If the child is dead, the placenta can be detached directly from the uterine wall by following the funis, without using force. If the child is living, the placenta must be peeled off by hand when it is not spontaneously detached within a few minutes; at the same time the patency of the cervix toward the vagina should be ascertained, and the placenta extracted through the abdominal wound. The separation of the membranes should receive particular care, after which the uterus is sponged out with a five-per-cent. solution of carbolic acid, and its inner surface dusted with iodoform. If the uterus does not contract well, it may be made to do so either by friction from without, or by the application of hot sponges, or by placing a lump of ice in its cavity. Electricity may be applied directly to its walls in case a dangerous degree of relaxation exists.

Sixth Step.—It is established beyond a doubt, by the meritorious work of Sänger (Leipzig) that the most careful suturing of the uterine wound is the weightiest factor in bringing about complete recovery. Although patients had, before that time, recovered from the so-called classical Cæsarean section without the suture of the uterus, so that in the succeeding pregnancy, the cicatrix remaining intact, the hysterotomy had to be repeated (*G. A. Michaelis*), yet results as brilliant as are obtained by Sänger's method have never before been attained, and thereby it has been proved anew that the chief danger of the operation lies in the infection of the abdomen from the inner surface of the uterus. The resection of a small strip of muscular tissue on both sides, which Sänger originally recommended, is unnecessary. The chief point is, and always will be, to sew the uterine muscle and the peritoneum separately and as firmly as possible. Sänger uses silver wire, but sublimated or chromated catgut or silk answer as well. The strongest material would be the most suitable for the muscular substance, and I would unhesitatingly plead for the use of silkworm-gut, were it not that its pointed ends produce an intense irritation of the muscles and perforate the thin peritoneum, and thus the complete closure of the uterine cavity might not result. Lately, Lebedeff and J. Veit advised the use of the continuous suture, first closing the decidua and submucous uterine tissue, then the muscles in one, less often in two layers, and finally the peritoneum. In this way the entire suture can be completed in a short time with only one long thread and two knots, one at the beginning and one at the end. J. Veit has proven that the peritoneal surfaces do not, as a rule, adhere to each other, and Grazer has shown that they separate after 5–7 days.

Seventh Step.—The abdominal cavity is very carefully cleaned of all fluids that have escaped into it, and the wound sewed up with silkworm-gut sutures embracing the peritoneum.

Eighth Step.—Iodoform gauze and salicylated cotton are laid over the wound and held in place with a gauze or elastic bandage.

Special deviations from this, the most favorable method of operating: In the *first step:* incisions on either side of the linea alba are no longer in use; they were made by Rousset (1581) laterally from the linea alba, by Levret obliquely, by Lauverjat transversely, by Stein, Jr., diagonally (1803). The incisions are always made in the median line, even if the Cæsarean section is repeated, as in second ovariotomies. In the *second step:* to prevent the wound from gaping, and to assist its closing, Kehrer has proposed to make the incision transversely through the lower uterine segment above the base of the vesico-uterine excavation. When this part of the uterus has not yet been especially thinned out, he considers it the proper place for the incision, for two reasons: first, the placenta is never attached there, and second, the extraction of the child meets with the least obstruction; indeed, the contractions of the uterus may even assist in its expulsion through this artificial passage. It has, however, the disadvantages that the incision gives way more easily, and the double row of sutures has by no means so thick and secure an attachment as when the body of the uterus is sutured. Owing to these disadvantages I believe that, since the firm suturing is the chief point in the operation, the vertical incision will be preferable.

In the *fourth step:* if the incision strikes the placenta and a profuse hemorrhage arises, enough of the placental tissue is rapidly detached with the hand, laterally or upward, to give access and permit extraction of the child; if the edge of the placenta cannot be reached at once, a large incision is quickly made in it and the child extracted through the placenta.

In the *sixth step:* in reference to the suturing of the uterus, Frank, besides a complicated method of draining the vesico-uterine excavation, has proposed sewing the round ligaments together in the upper part, and uniting them with the parietal peritoneum in the lower—a modification which fortunately has become obsolete with the establishment of Sänger's.

Finally, the *after-treatment* is the same as that of an ovariotomy: if the pains are very severe, morphine hypodermatically and an ice-bladder over the bandage; as little drink as possible during the first four or five days, and none at all if vomiting set in. Until the fourth or fifth day no attention is paid to the bowels, then an enema or castor oil is given. The bandage is to be changed on the tenth, twelfth or fourteenth day, then again after a week; a binder must be worn.

In conclusion, I would add that, while the mortality of the women is 2.2 per cent. after the induction of premature labor, 4.8 per cent. after version and extraction, 2.8 per cent. after perforation, there is still a mortality of 8.6 per cent. after Cæsarean section (this was recently 54 per cent., according to Meyer—of 1605 women 867 died) even by the most experienced operators; half of these were cases of infection. I am of the same opinion as Wyder and J. Veit, that the old mortality will soon be reached if the operation is undertaken very frequently outside of well-conducted institutions. The power of conception of the woman seems to be decreased after the Cæsarean section. In regard to the children, comparisons show that 66.6 per cent. and 66.2 per cent. are saved after version and extraction, and 87 per cent. after Cæsarean section.

CHAPTER VIII.

The Porro Operation. Laparotomia cum hysterectomia partiali.

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Porro (Milan), in 1876, being convinced that the chief danger in Cæsarean section consisted in leaving behind the wounded uterine body in the abdomen, proposed that the body of the uterus in this operation should be removed each time as far as the cervix; that is to say, to perform supracervical amputation of the organ by laparatomy. While the mortality after the Cæsarean section, according to the statistics of P. Müller (Berne), amounted to 85 per cent. in the hospitals, the results of the Porro operation brought the recoveries very quickly to 50 per cent., and since the dangers of future conception and rupture of the uterus were removed by the operation, the balance of public opinion appeared quickly to incline strongly in favor of an operation which removed, along with the child, the body of the uterus, which, it was said, was not only dangerous but in many cases useless. In opposition to this assertion, the rule must always be adhered to, that the operator should be as conservative as possible in every operation; that he should not unnecessarily cut away any of the organs which have their purpose in the human organism; and that he should always strive rather to restore them to their integrity, inasmuch as spontaneous deliveries of living children have sometimes occurred after Cæsarean section. Therefore the Porro operation has been, so to speak, driven out of the field by the brilliant results which have been reached in so short a time by the Sänger method, excepting in the few cases in which, as we shall see below, the indication for this operation is beyond all doubt.

The *indications* for the operation, which no man can dispute, are the following: the removal of the body of the uterus and the ovaries, together with the child, by laparotomy, is indicated if the impregnated uterus is defectively developed or is the seat of some incurable disease. The Porro operation may therefore be done: (*a*) in pregnancy in a rudimentary horn of the uterus, when the ovary on the rudimentary side is to be removed at the same time; (*b*) in hernia uteri gravidi bicornis inguinalis, if it cannot be reposited (see page 247); (*c*) in the case of large and numerous myomata in the walls of the uterus; (*d*) in infection of the body of the uterus during labor; (*e*) in severe puerperal osteomalacia, because each subsequent pregnancy, with rare exceptions, aggravates the disease and makes it less amenable to treatment; (*f*) in very extensive adhesions of the vault of the vagina, and in echinococci of the uterine wall and of the pelvic cellular tissue, which we cannot remove in any other way and which make the pelvic canal absolutely impassable. Finally, B. S. Schultze has done a Porro successfully in a case of retention of the placenta for seven days, associated with sloughing and rigors, where the uterus alone was diseased, and the septic infection did not extend beyond. In all of these cases, indeed, the uterus has become useless and even dangerous to the woman, and should be extirpated with the ovaries; this indication applies whether the children are dead or living.

I must take exception to the indication which has been advanced by Sänger for the Porro operation, namely, after a repeated classical Cæsarean section; because it may be of both psychical and material advantage to such a woman, if she has lost the first or both of her children, to be given the chance of having a living child, even at the risk of jeopardizing her life by a rupture of the uterus during pregnancy.

Performance of the Operation.—The preparation and *first step* are the same as in a laparotomy. The best time for it is, under *a* and *b*, at the end of pregnancy when the child is living; if the fœtus is dead, from one to two weeks after its death. Under *c* and *d*, however, the middle or end of the first stage of labor.

Second Step.—After the incision has been made through the abdominal wall, at least up to the umbilicus, and the uterus has also been opened, the child and placenta are, according to the teachings of Porro, drawn out of the uterus as in a classical Cæsarean section, and the uterus is then brought out of the abdominal wound, so as to secure and ligate its neck.

P. Müller has proposed, instead of this, that the border of the uterus, which for the most part lies anteriorly and is rather thick, be drawn into the abdominal wound immediately after opening this cavity, and that the assistant then push the upper end of the wound over the fundus uteri, if necessary enlarging the incision above the umbilicus. After which an elastic ligature should be passed below the child's head, which must be lifted out of the pelvis if it be somewhat engaged, taking care to avoid the bladder and the coils of intestines; the crossed ends of the ligature should then be secured with clamp-forceps or sutures and the cavity of the uterus rapidly opened in the usual manner and the child extracted. The placenta can be left in the uterus in these cases.

Third Step.—After the cavity of the abdomen has been rapidly cleansed of blood and liquor amnii, the upper portion of the wound is united with silk-worm-gut so as to prevent the escape of the intestines; then the uterus is cut off 1½–2 cm. above the elastic ligature with a knife or the Pacquelin cautery.

Fourth Step.—Either the uterus is sewed fast to the abdominal wall in such a manner that, being held in place by two nickel-plated metallic needles passed through it at almost a right angle, its peritoneum is carefully sewed to the parietal peritoneum of the wound with silk or catgut, which is attached 1½–2 cm. behind the ligature (the stump is finally covered with iodoform gauze, and over this salicylated cotton is laid); or, after gently drawing forward the stump, the uterine mucous membrane is first united with a row of silk sutures, then the muscular tissue over this, and finally the peritoneum, with the greatest exactness. The ligature is loosened and removed, and in case the least trace of hemorrhage is noticed after the stump has again filled with blood, other sutures are applied or the afferent vessels of the broad ligaments are ligated. Then the pedicle is dropped.

Fifth Step.—The closing of the wound and bandaging, as well as the after-treatment, are the same as in laparo-hysterotomy.

Suppuration of the stump is to be guarded against only when it is treated extra-peritoneal, by brushing it over with a 10-per-cent. solution of chloride of zinc or with tincture of the chloride of iron. The metal transfixion needles are removed about the tenth to twelfth day. Whether the extra- or intra-peritoneal treatment of the pedicle offers the better chances can only be ascertained by a comparison of both methods in a larger number of cases. I consider the intra-peritoneal treatment the most rational practice with regard to the bladder and the painful dragging which is often produced by ovarian pedicles that have healed in the lower angle of the wound; the latter will certainly be present in these cases also. It could only be superseded by the other mode if this were able to show much better results, which does not seem very likely to me after the experience of Sänger with uterine sutures.

Appendix.—While all of the laparotomies and laparo-hysterotomies already described were performed easily and without any appreciable loss of time in 1–1½ hours, a proposition was made to perform the Cæsarean section subperitoneal, at a time when the peritoneum was held to be more vulnerable than other organs and its injury was greatly feared. This was executed by Jörg and Ritgen (1820), and was practically buried in Germany, when it was resurrected by Thomas (New York, *Amer. Jour. of Obst.*, III, 125) and Skene (Brooklyn) in 1878—the so-called *abdomino-vaginal section*, gastro-elytrotomy, laparo-colpotomy. The incision, passing from the anterior superior spine of the ilium parallel with Poupart's ligament to the spine of the pubis, and severing the inferior epigastric artery, with the muscles, extends down toward the vault of the vagina, always sub-peritoneal and with the careful avoidance of the bladder. The vaginal wall is then cut open upon the index and middle finger introduced per vaginam, so that the hand can be introduced and the child delivered through the cervix and vagina above Poupart's ligament.

This operation has no future. It rests on false premises concerning the peritoneum; it is much more difficult than the ordinary Cæsarean section; the adjoining organs, especially the bladder, are easily injured in it; the entrance of vaginal and uterine secretion during the operation is unavoidable; the resistance of the cervix, in case the os is not yet fully dilated, is very great, and therefore the child's life is much more jeopardized on account of the cramped space than in the classical Cæsarean section. Finally, it seems highly probable, because of the unfavorable direction of the traction, that deep lacerations of the cervix into the lower segment of the uterus are almost unavoidable, and, above all, the traumatism (extreme stretching, contusion, forcible introduction of the hand) is much more severe than in the other; in other words, the prognosis would be bad for the healing of the wound.

May these lines serve to hasten this operation once more to a silent burial. God protect us from any future resurrection! but much more let Him guard the poor parturients with contracted pelves who seek help from us physicians.

With the same wish we pass to the consideration of the section of the pubic bones, *symphysiotomy*, which was done for the first time by De la Courrue, in 1654 (v. Siebold, E. C. J.: "Abbildungen aus der Geburtshülfe." Berlin, 1829, S. 238), devised and practiced anew by Sigault (1768), converted by Stoltz into a pubeotomy, *i. e.*, a sawing through of the pubic bone at the symphysis, combined by Galbeati into symphyseo-pubeotomy, and lately recommended very strongly by Morisani. It has not fulfilled what was promised of it, but has produced, in many instances, what was not expected —injuries of the bladder, stretching of the sacro-iliac articulations, and caries of the anterior wall of the pelvis. May this also be forever entombed.

CHAPTER IX.

The Artificial Removal of the Placenta, the Membranes, and Fragments of Placenta Left Behind in Utero.

LITERATURE.

Breisky: "Volkmann's klin. Vorträge," Nr. 14, 1871. Guéniot: *Arch. de tocol*, I, 739, II, 17, 76. Kühne: "Die künstliche Lösung der Placenta innerhalb der Eihäute," Inaug. Diss., Leipzig, 1873. Runge: *Archiv für Gynäkologie*, XIII, 13. Trousseau: *Gaz. des hôpit*, 1853, Nr. 32. Windelband: *Deutsche med. Wochenschrift*, 1876, p 24.

In speaking of the physiological process of the separation of the placenta, and also in the division of parturition into abortion, immature and premature labor, we have already called attention to the difference in the process of delivery, especially in regard to the third stage. We have further shown, in the historical portion, that, although Hippocrates did not consider it especially dangerous to leave the placenta behind in a normal labor, an active procedure was looked upon favorably by the ancients, and the third stage of labor was not so expectant as many recent authors affirm. How often have the sneezing and coughing remedies, and the methods of pressure afforded food for merriment, when recommended as means for removing the placenta, and yet we must acknowledge that they are decidedly rational, according to our present ideas of the significance of the abdominal pressure in expelling this body.

The indications for the artificial removal of placenta, membranes, or retained fragments vary according to the time at which the partial expulsion of the ovum has occurred:—

(*a*) *After abortion* the grounds for this operation may rest upon hemorrhage of a dangerous character, fever and an ichorous discharge, and also when fragments project from the uterus, for we know well that these must undergo rapid decomposition and cause any of these three symptoms. However, any acute inflammatory process, *e. g.* parametritis, is a contra-indication, because the local infection may thereby be very easily made general, and the danger greatly enhanced. The time which has elapsed since the incomplete expulsion of the ovum is, of itself, no absolute indication for artificially removing the retained fragments, since these, as I have repeatedly observed, may be expelled more safely and thoroughly by the natural powers without danger to the mother, even after the expiration of eight or nine days, than would be possible at our hands.

(*b*) *After immature labor.*—Here the same indications apply as under (*a*), with this addition, that the ordinary methods of removal of the placenta, especially expression, must have been unsuccessful or contra-indicated; and with the further qualification, that the placenta should not be removed artificially unless it does not escape spontaneously within 8–14 days, because it is generally delivered within this time, and that, too, without a trace of decomposition.

(*c*) *After premature and mature labor*, the artificial removal of the placenta or retained fragments is indicated as soon as the customary methods, which must have been systematically employed, have proved futile; that is to say, according to circumstances, usually within 3–24 hours, if hemorrhage, fever, infection, sloughing, collapse, exhaustion, or, in short, any danger to the mother, be present.

The difference between the indications under (*b*) and (*c*) lies merely in the time, which has been given under (*c*) as within the first twenty-four hours, because then the cervix is still sufficiently yielding, and the operation therefore is less severe. This does not, however, apply under the head of (*b*), because the physiological process runs a slower course and embraces a wider limit, and because any operative interference is more dangerous and difficult owing to the moderate preparation of the cervix and the firm adhesion of the placenta. The condition common to all of these three groups is this: that the general state of the partially confined woman permits an interference of this kind; in other words, that she is not moribund.

Preparation.—Placental operations are often very tiresome; the hand must frequently be introduced several times; they are difficult because the uterus even under anæsthesia offers a very strong resistance; and they are dangerous because the uterine walls are of varying thickness, easily stretched, scratched, and perforated; finally, because pieces of the placenta are apt to be left behind, and may become just as pernicious for the puerpera as the retention of the entire structure.

Preparation of the Patient.—Irrigation of the vagina and uterus, complete anæsthesia, and the most suitable position for the individual case: dorsal decubitus, or the left lateral prone position.

On the part of *the operator:* A board, or a flat dish, an irrigator with a 3-per-cent. solution of carbolic acid, to which is attached one of the tubes invented by Prof. Rein, of Kiew, Figs. 171–173, a sharp spoon after Simon, or one of Henrichsen's placental spoons, or one of Recamier's curettes, whose spoon is broader and blunter on the edges; these are placed near the operator in a carbolic solution of the same strength. A hypodermic syringe filled with ether and bandages for auto-transfusion must be at hand in case the patient is very anæmic. A hypodermic injection of ergotin, 0.05–0.1, should be given after every such operation.

Performance of the Operation.—(*a*) *After Abortion.*—The introduction of only two fingers generally suffice. These are passed into the cervical canal, and then the uterus drawn forward to the anterior pelvic wall. While the external hand depresses the uterus like a thimble over the fingers, the latter advance gently, scraping at the same time between the wall of the uterus and the remains of the ovum at the point where this prominence is felt. All loosened fragments, along with the coagula, are laid on the plate, the inner surface of the uterus is repeatedly and carefully examined, and is finally washed out through a Rein's catheter with a 3-per-cent. solution of carbolic acid. If the retained fragments are small and flat, and not to be removed with the fingers, they must be scraped out with the sharp spoon (Fig. 174), or Henrichsen's instrument, but without using any force, and confining the

FIG. 171.

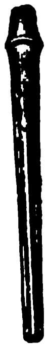

FIG. 172.

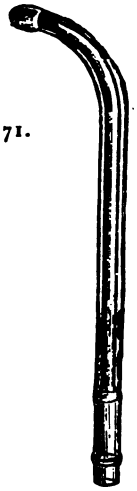

FIG. 173.

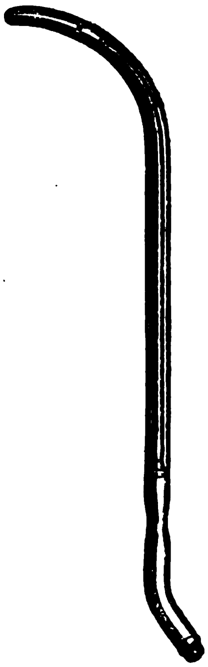

FIG. 174.

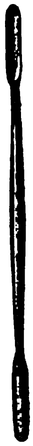

FIG. 175.

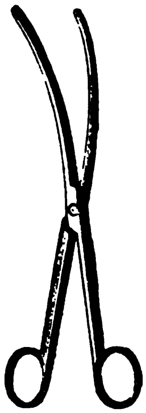

FIG. 176.

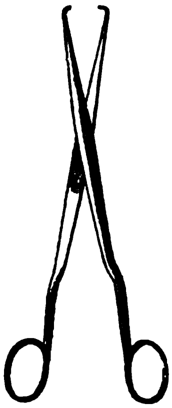

FIG. 171. Double glass tube for vaginal irrigation. (*Prof. Rein.*)
FIG. 172. For the uterus.
FIG. 173. Double glass tube for irrigation of the puerperal uterus. (*Prof. Rein*, of *Kiew.*)
FIG. 174. Spoon for scraping out fragments of placental tissue.
FIG. 175. Forceps for removing fragments of placental tissue.
FIG. 176. Bullet forceps.

application of the instrument to those places on which the fragments still remain. If the cervical canal is not passable, it is opened with metal dilators, the external os being exposed by a Sims speculum and then the curetting performed.

For this purpose, the anterior lip of the cervix must be firmly grasped with a pair of bullet forceps (Fig. 176), whereby the operator appreciates the resistance which he meets with in introducing the dilators and does not stretch the uterus too much.

(*b*) *After immature labor.*—So long as the cervix is easily passable or dilatable, the whole hand may be introduced to loosen the placenta, in case it is attached near the upper part of the uterus and can only with difficulty be reached with two fingers. If its attachment is lower down, two fingers, as a rule, suffice, as they do in the cases where cervix and os uteri have become narrower.

(*c*) *After premature or mature labor.*—The parturient is placed on the side on which the cord passes up, where the greater portion of the placenta is in all probability attached. The hand corresponding to this side is chosen and introduced with the assistance of the external hand, as in version. The membranes at the os internum are pushed to one side and efforts made to pass between the uterine wall and the placenta. Hildebrandt-Kühne advise that this be done with the membranes enveloping the fingers. If the uterine surface of the placenta is already to be felt in the cervix, it is necessary to proceed along it to the spots where it is most firmly adherent, to press firmly against the fundus and wall of the uterus at this point and to scrape the placenta from the uterine wall until no great prominence remains to be felt and the placenta is easily movable. Then it is grasped with the fist and carried with a gentle rotary motion out of the genitals, and spread out at once on a board or plate so as to examine thoroughly the margin and all of its cotyledons. If a fragment, 2–3 cm. in size, is wanting, the introduction of the hand must be repeated and every fragment sought for and removed. It may occur that the hand must be reintroduced three, four or five times. If the membranes are felt to tear and remain behind, they can be twisted into a cord with the hand at the cervix and slowly drawn out. If this fails a speculum is introduced, the anterior lip of the cervix grasped with bullet forceps, drawn down and the string of membrane seized with broad dressing forceps (Fig. 175) so as to twist this around and extract it; all that is within sight or to be felt is thus removed with the forceps. I consider it unnecessary to introduce the hand again on account of the membranes if the placenta has been completely removed or spontaneously expelled. It is a dangerous interference which I have always advised my assistants against and have myself never performed.

After thoroughly disinfecting the genital canal and continuously watching the contractions of the uterus and the discharge of blood, the puerpera is placed in an ordinary warmed bed, an injection of ergotin is given, any existing anæmia or signs of collapse are immediately treated (restoratives, auto-transfusion); if there is no hemorrhage the ice bladder is laid over the uterus and is left there for ten to twelve days, if necessary.

The *chief danger* after the artificial separation of the placenta consists in metastatic puerperal mycosis (abscess of the lungs, spleen, liver and kidneys, and embolism of the pulmonary artery). If any elevation of temperature appears, it is best controlled by the ice bag and quinine.

I have been obliged to separate the placenta manually only 42 times in more than 5000 deliveries from 1879–1883, that is only 0.75 per cent., of whom 6, or 14 per cent., died. In two, diminution of the size of the child had been previously required on account of hydrocephalus with rupture of the uterus, one of whom died from double pneumonia on the twelfth day, apparently the result of the separation of the placenta. Of the rest, three presented symptoms of that metastatic infection-mycosis, and only one, an eighteen-year-old primipara, died of pernicious anæmia associated with a lesion of the vagina caused by the forceps. Primiparæ and multiparæ were about in equal proportion in these operations. Since that time, in Munich, artificial separation of the placenta was necessary only eight times in 3500 deliveries, 0.23 per cent., or three times less often (under the expectant treatment of the third stage). In spite of antiseptic (sublimate) treatment three of these died, one from air-embolism, two from metro-phlebo-thrombosis. Altogether nine, or eighteen per cent. of these 50 operated upon, died—a number which plainly shows the great risks of these operations.

CHAPTER X.

Forcible Delivery. Accouchement Forcé.

By accouchement forcé are understood three operations which have already been described in Chapters II and V, of Section II, and Chapter I, of Section III (pp. 634, 641, 677), viz., the manual or instrumental dilatation of the cervical canal and combined version with immediate extraction of the child. A repeated description of these operations is, therefore, unnecessary. The indications for them seldom occur and have already been discussed in the description of the treatment of placenta prævia, and the sudden death of the pregnant woman. Fortunately, the indication for this method of delivery has been still further restricted by the Hohl-Braxton Hicks method. Even in case of sudden death of the parturient, accouchement forcé is indicated at most in those cases in which we may hope to deliver the child quicker by this method. It should not be forgotten, however, that the loosening of the arms may take considerable time and forfeit the child's life.

That accouchement forcé is contra-indicated in eclampsia, is evident from what has been said on page 596.

In general, this question can arise only in actual labor, when the cervix has become slightly relaxed by uterine activity and is already somewhat yielding. Even then it is to be hoped that the operation will continue to decrease steadily in private practice.

PART VII.

PATHOLOGY AND THERAPEUTICS OF THE PUERPERAL STATE.

CHAPTER I.

Wounds of the Genitalia of Puerperal Women.

1. *Lacerations of the Perineum.*

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Anatomical Statements.—The perineum ordinarily is from 3 to 4 cm. long, but during delivery is often stretched to 16–20 cm. by the descending fœtal part. Laceration of the perineum commences at the frenulum or at the point where the fibres of the constrictor cunni cross each other, or within the introitus vaginæ. Some authors believe that, as a rule, the mucous membrane of the vagina is torn first from within, then follow the fascia and muscles, and finally the external skin from the frenulum downward; they call these peripheral lacerations to distinguish them from central ones. Lacerations of the perineum, moreover, are divided into superficial (or broad) and deep, and, according to the extent of the injury to the perineum, into the first, second and third degree. In *superficial ruptures*, the lesion involves only the perineal skin and the superficial perineal fascia; in the deep, the lowest part of the posterior vaginal wall and the muscles of the perineum, that is, the small fibres of the constrictor cunni which go to the sphincter ani, then the superficial transverse muscle, and next to this the profundus and the deep perineal fascia are severed. Lacerations of the *second degree* extend to the sphincter ani. In those of the *third degree*, the sphincter ani externus, the mucous membrane of the rectum, and often a good part of the posterior vaginal wall are torn through. Usually the laceration passes through the middle of the perineum, more rarely to one side. If it appears first in the middle of the perineum, the external skin and the deeper tissues may yield first, or the tear commences first on the posterior vaginal wall; this is followed by the laceration of the deep perineal muscles, and, last of all, of the skin. If the rectum and the posterior commissure remain uninjured, it is called a central rupture. The edges of the wound are either clean cut or more or less ragged. The appearance of a central rupture may be **T**- or **X**- or **+**- or **Y**- or **V**-shaped. The breadth of the bridge of skin remaining on the posterior commissure seldom exceeds 1 cm. In exceptional cases the perineum may tear obliquely to one side, in which case the laceration may involve the broad part of the bulbo-cavernosus muscle at the insertion of the septum perinæi transversum. At the same time the median raphé and both labia may tear.

Symptoms.—A cutting, burning pain at the moment the child passes through the vulva is for the most part the first symptom, and many women appreciate at once that they are torn. In the case of deeper injuries, hemorrhage from the surface of the wound occurs, which is usually venous and of slight import, on account of the direction of the laceration and the lateral position of the common pudic artery. In the case of slight ruptures the pain subsides in a few hours. When they are deep, however, the pain persists for a long time, and is increased by movement, turning in bed, sitting up, and especially by passing water. If the edges are not brought together with sutures, they frequently become œdematous, and the skin is reddened; here and there portions of the wound become discolored, and small extravasations occur into the tissue about the edges; these spots at times become gangrenous and slough off. Sometimes a severe hemorrhage occurs from the wound after four or five days. In 9 per cent. of the cases I observed retention of urine in cases of perineal lacerations, both with and without œdema of the perineum. Duparcque has found a great variety of examples of central ruptures, the result of "perineal deliveries." Douglas observed a laceration through the soft parts, caused by the child's head, not situated in the median line, but extending from the posterior end of the left labium toward the tuberosity of the ischium. After such injuries the posterior commissure is now and then destroyed by ulceration, or the wound closes up completely of itself, or a perineal fistula is left (*Simpson*, *Master*, *Halmagrand* and *Stoltz*), through which the secretion of the vagina and the menses may escape, and the uterus at times prolapse.

If the lacerations are left to themselves, as a rule they heal almost completely in two and a half to five weeks by granulation; in my experience, on an average in three and a half weeks, provided no puerperal ulcers form on them. If no infection takes place during the delivery, any reaction is entirely absent and the temperature curve entirely normal. In some cases, however, a traumatic fever is met with which lasts for from two to seven days. The fever frequently begins immediately after delivery with a slight chilliness, seldom with a severe chill, and falls, as a rule, on the evening of the second to the fourth day. It may rise to 104° F., but remains as a rule under 102.2° F. If the edges of the wound become œdematous and puerperal ulcers are formed, the fever lasts much longer, the reparative process is slower, and the defect in the perineum is greater. The latter is shortened by cicatrization, often only a small bridge of tissue remaining, and the vulvar orifice becomes longer and considerably broader posteriorly. The permanent enlargement of the vulva is caused by the contraction of the cicatrix, so that the vaginal mucous membrane is drawn down on the sides and posteriorly by the contraction of the suppurating surfaces, while the skin, on the contrary, is not drawn inward because it is fixed by the sphincter ani. In this way the posterior vaginal wall may be shortened several centimetres. If the tear extends into the sphincter muscle, the woman cannot retain the intestinal gases; at times she suffers from incontinence of fæces, at least in the case of diarrhœa. On the other hand, it has happened that such an extreme narrowing of the vagina has resulted from perineal lacerations with extensive cicatrization, that the opening would scarcely admit a catheter

(*Krieg*). In lacerations of the third degree a recto-vaginal fistula sometimes remains after a portion of the perineum has healed (*G. Simon*).

The recognition of the laceration is easy. After every delivery the perineum must be examined, the woman being in the lateral prone position. Since this body is so tremendously stretched toward the end of labor, small lacerations appear quite large immediately after delivery; these diminish very rapidly in size with the shortening of the perineum. In order to recognize properly the depth of the laceration and the character of the injury, a finger should be passed into the rectum and its anterior wall pressed forward. Thus the thickness of the vaginal wall, the surface of the wound, and the integrity of the parts belonging to the rectum can be carefully investigated, and the source of any hemorrhage readily ascertained.

Etiology.—The causes of perineal lacerations may, first of all, be due to the woman herself; among them may be mentioned: abnormally strong pains, excessive straining on the part of the parturient, narrowness and rigidity of the vulva, an uncommonly long perineal body. Special importance, however, attaches to diseases of the vulva and vagina, such as acute and chronic œdema, scars and ulcers; the former existing with nephritis, twin pregnancy, and hydramnios, the latter after excessive venery. B. Schultze speaks of abnormal tenseness of the triangular ligament as another cause. It seems to me probable that this is often confounded with a narrow pubic arch, at least by those who place the narrow pubic arch among the most frequent predisposing causes (*Hugenberger*), since this latter anomaly occurs rather seldom, except in osteomalacia. Too slight an inclination of the pelvis has also been adduced as a cause (*Kiwisch*), since the head is thereby directed more against the middle of the perineum, and in this event a portion of the space under the symphysis remains entirely unused. I must concede the possibility of this mode of their occurrence, although I have not found perineal lacerations more frequent in rachitic patients with a flat sacrum, and in cases of osteomalacia with a narrow pubic arch, than in others. To be sure, osteomalacic parturient women are generally multiparæ, and their genitals are usually larger and more yielding. Lippert and Birnbaum suggest an extreme curvature of the sacrum as a cause, but I can only reply that, under such conditions, the perineum does not suffer any special pressure, since the chief force is brought to bear on the anterior wall of the pelvis. Mekerttschiantz believes that the causes of perineal lacerations may arise from slight anomalies of the pelvis, such as too great a prominence of the sacro-vertebral angle, too great an inclination of the pelvic inlet, absence of the curve of the sacrum, lack of firmness of the coccygeal articulation, a broad pelvic outlet, a narrow pubic arch, and an excessive length of the symphysis.

Perineal lacerations, of course, occur most frequently in primiparæ. Extreme youth and advanced age are especial predisposing factors; unfavorable presentation and attitude during labor are of etiological importance (see precipitate labor).

The causes which arise from the child are excessive development of, or a too hard and unyielding fœtal head.

A faulty escape of the fœtal head, face presentations, and also incomplete flexion of the head predispose to lacerations.

The cause of the injury is not infrequently to be attributed to the midwife or the obstetrician. I do not consider the statement of Ch. Clay correct, that the cause of the frequent lacerations depends on the attempts which are usually made at the present time to preserve the perineum, but am rather convinced that a rational effort to protect this body can often save it; yet this often fails through aimless or untimely and discontinued support. Many lacerations, however, are unavoidable, in spite of the greatest care. Olshausen gives the frequency of these unavoidable cases as at least 15 per cent. in primiparæ, and he does not include simple lacerations of the frænulum alone. I am fully in accord with this statement. The obstetrician may produce very bad lacerations by the use of instruments, especially if he delivers the head too rapidly through the external genitals; in this way the perineum cannot expand slowly enough or the edges of the blades produce the lacerations. Further, they may be caused by the slipping of the forceps, cephalotribe or hook, and by the forcible introduction of the hand. Lacerations to the third degree hardly ever occur in vertex presentations, but they do in pelvic presentations, and in cases where labor must be terminated artificially. I found 20 per cent. of perineal lacerations, K. Schroeder 34.5 per cent. in primiparæ, and 9 per cent. in multiparæ.

The laceration usually commences with the escape of the head, and is increased somewhat by the shoulders; at times, however, the uninjured perineum tears with the passage of the shoulders. C. O. Weber asserted that almost all lacerations arise thus: The head of the child forces before it the posterior wall of the vagina, which, to a certain extent, is rolled out over the posterior commissure; when the latter tears, the rupture usually extends laterally into the vagina, and has the shape of a **V**. This is wholly correct for some cases, but, as is easily demonstrable by the sense of touch and sight, does not apply to the majority.

Prognosis.—If the perineum was healthy before the receipt of the injury, and it has been carefully reunited, 75 per cent. of the cases heal by primary union. Even in those cases in which the repair takes place by granulation on account of a diseased condition of the edges of the wound, the result is favorable, as a rule. A careful repair of a laceration occurring in the first delivery is by no means troublesome in subsequent labors; such patients may have easy confinements, and are often delivered without any laceration. Before the time of Lister I found œdema of the edges of the wound and puerperal ulcers of the worst type in 11.5 per cent. of my cases. It is self-evident that perineal lacerations predispose to severe puerperal diseases. This is satisfactorily proven by the experiences of Hecker, Souden and the author. On the other hand, the prognosis is better in these than in lacerations which are situated higher up, since the former are more easily and thoroughly cleaned, or, in other words, disinfected. A partial inversion of the anterior or posterior vaginal wall follows quite frequently after lacerations which have not healed by primary union. There are a number of cases in which peripheral and central ruptures have perfectly united spontaneously (*Behm*, *Lamb*, *Priestley*, *Nusser*, *Schmidt*, *Müller* and others). The prognosis is unfavorable only in those cases of laceration through the sphincter ani in which inflammation of the wound has set in and primary union has not been obtained; and the condition of such patients in the end may become just as unbearable as that of those who suffer from vesico-vaginal fistula.

Treatment.—We are concerned here only with the treatment of existing lacerations, and not with the methods of their prevention. The experience of most authors shows that the immediate reunion of the edges of the wound by sutures is by far the best treatment. I sew up superficial lacerations with the parturient on the side. The upper buttock is held back by an assistant; in order to carefully reunite the edge of the wound any discolored parts are removed with the scissors and then several silkworm-gut sutures are inserted, according to the length and depth of the wound, the edges of which are only brought together when all of the sutures are in place. I insert the sutures ½–1 cm. from the edge and pass them as deep as possible; the firmer they are, the sooner does union take place, and so much the more certainly is the lochia kept out of the wound. It is sufficient to insert the sutures through the skin alone in the case of superficial lacerations; when they are deeper it is well to insert interrupted sutures through the vaginal mucous membrane, or to sew up the perineal wound with a continuous catgut suture, beginning at the upper end of the wound in the vagina, and proceeding down to the posterior extremity; after knotting this, another continuous suture unites the external wound. The catgut is always absorbed in seven days (*Keller*). Interrupted sutures are removed on the sixth to eighth day; if swelling of the parts sets in, it is necessary to remove the sutures, only when they begin to cut through; otherwise cold lead-water-applications are made. If the vagina was diseased previously, or endometritis is present, I allow douches of a carbolic solution (3 per cent.) to be given two or three times a day, otherwise I do not use them. I am in favor of using sutures, even if colpitis or slight œdema of the perineum was present during delivery, and I have seen many cases heal by primary union in spite of them. On the other hand, I would not apply the sutures in such cases three or four days after delivery, as Brown and, of late, Brothers and Schwarz do; still less would I suture if gangrene were present. If the tissues are ragged, swelled and infiltrated, delay is to be recommended until they have completely regained their vitality. The use of opium after the operation, in order to bind up the bowels for eight to ten days, is not beneficial; the regular daily use of enemata is better. The advice of Reybard, to introduce a rectal tube, in order to provide an immediate escape for the gases and fluids, is certainly to be dispensed with. Simon recommended laxative treatment after these operations on the perineum (Ol. Ricini, ℥j; calomel and jalap). The regular use of the catheter is unnecessary; it is to be advised only when the urine is not easily passed in the abdominal position of the patient. The English, Parker and Brown, advise the subcutaneous division of the sphincter on both sides of the coccyx, if the lacerations extend through the sphincter ani. If the rectal and vaginal mucous membranes are much involved, they should be reunited by very deep interrupted sutures; in the case of such lacerations the operation is not to be done on the bed, but on a table, the patient being in the lithotomy position; there should be plenty of assistants and good light, and the union should be effected with the minutest care. The knees are afterward to be tied together and the puerpera made to lie chiefly on the side. In the case of smaller lacerations it is unnecessary to be so particular about the position of the woman.

The use of the serres-fines is almost obsolete at the present time. The same is true of the collodion bandage, which was recommended by Grenser.

The treatment of old lacerations and of deep cicatrices of the perineum does not belong to this chapter. It is of no consequence what material is used for the suture, if the operation is but carefully done.

If sutures cannot be used at once for reuniting the wound, great attention should be paid to cleanliness; the patient should retain the recumbent position for a long time, all efforts at straining should be interdicted, and the reparative process assisted by sprinkling the wound daily with iodoform. After complete cicatrization has recurred—two, three or four weeks after delivery—the surfaces may be freshened and the wound united. The treatment of puerperal ulcers, the result of a perineal laceration, will be spoken of in another chapter.

2. *Other Lacerations of the External Genitals and of the Ostium Vaginæ.*

Lacerations which sever all the tissues do not occur alone at the perineum, but also at other parts of the vulva. Transverse lacerations of one or both nymphæ have been observed, dividing them into several lobes; perforation of one of them is also not very rare. Sometimes deep lateral lacerations are seen extending obliquely through a nympha and labium majus without any injury to the perineum. Much more frequent than these are more or less deep lacerations of the mucous membrane of the vestibule, especially at the inner surface of the labia minora. These vary in size, have irregular edges, and often several of them are close to each other. They frequently occur directly along the side of, or above the meatus urinarius. They cause burning pain during micturition and may lead to retention of urine. They at times change into bleeding ulcers, and are associated with œdema of the nymphæ, since it is almost impossible to prevent them from being bathed in urine; they make the use of the catheter very painful. These fissures may be the source of considerable venous or arterial hemorrhages, on account of the injury to the numerous vessels in these parts. Since the source of such hemorrhages is apt to be discovered rather late, the puerperæ become at times quite anæmic before the hemorrhage is controlled. As a rule, these tears heal spontaneously after the cessation of the bleeding. Interrupted sutures are to be inserted into transverse lacerations or perforations of the nymphæ and the labia majora; no attention need be paid to the smaller tears, except, perhaps, to sprinkle iodoform over them.

3. *Lesions of the Vagina without any Communication with the Neighboring Organs.*

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Lacerations may occur on all sides of the vagina; they consist either of lacerations of the mucous membrane and the muscular structures, in which the peri-vaginal cellular tissue is laid bare, or they are only lacerations of the mucous membrane. Such tears extend usually longitudinally, may be 10 cm. long (*C. v. Braun*), and are found for the most part on the posterior wall and the portions of the vagina limited by the columna rugarum, especially where the face presses the parts down. They are also seen at the spines of the ischii. Their edges are smooth, as though they had been cut, or uneven, with ragged shreds; in the latter case extravasations of blood often occur into the surrounding tissues. The shape of contusions is mostly round. They vary in size from a bean to a walnut, and have a well-defined margin. In form they correspond to the pressure sores of the fœtal scalp which occur in contracted pelves. They are situated about the middle of the vagina, posteriorly as well as at the neck of the bladder and in the lower part of the posterior vaginal wall. Smaller lacerations of the vagina occur alongside of the urethra on the anterior wall.

Symptoms.—The symptoms of the above-described lesions of the vagina are often remarkably slight; those which immediately follow the receipt of the injury are usually unimportant. Profuse hemorrhages may occur with the more extensive lacerations. The patients do not complain of pain at all, but may suffer from a burning sensation and some tenesmus during micturition. Vomiting is rarely seen, and peritonitis is only to be feared if the lacerations are situated high up on the posterior wall of the vagina. I have more often observed retention of urine lasting 10–14 days, as a result of these injuries. If the lesion is on the posterior vaginal wall the discharges may lodge in the wound, and an inflammation may be set up there, as well as in the pelvic cellular tissue, and abscesses and sloughing occur. The pus may burrow into the rectum or vagina, or may pass down toward the perineum. The latter is rare; Kiwisch has never seen it, and I have observed it only once. Several days before the rupture of such abscesses an œdema of the vulva is to be observed on the side which corresponds to the site of the laceration. If inflammation sets in or ulcers are formed, an excessive œdema of the vagina is generally noticed, and the discharges become offensive and contain pus. Defecation is at times painful. A high fever of a remittent type existed in all of my cases, and yet primary union without any fever is possible. C. Braun, Ruhfus and the author have repeatedly observed rapid cicatrization even in the largest lacerations.

As regards the *termination* of these lacerations, there may result: complete cicatrization, or the formation of ulcers, with perivaginal abscesses and rupture into neighboring organs, or, finally, death from repeated hemorrhages as well as from puerperal infection.

Diagnosis.—Small lacerations, especially such as are caused by the forceps, are easily overlooked, on account of the absence of any subjective symptoms; even the larger tears are only discovered accidentally. An important indication of their presence is an œdema of one side of the vulva, if the cause of this is not to be found in puerperal ulcers of the vaginal outlet. In such cases the examination need be made only with the finger; with it we can readily distinguish the lacerated point, its length, the character of its edges and the depth of the wound. The speculum should be used only with the greatest care and gentleness, because the dilatation of the vagina will separate the parts which have already become united. The best instruments to use are the half-specula which are used for operations on vaginal fistulæ, Sims' or Simon's fenestrated speculum. The examination of the rectum with the finger, or the bladder with the catheter, is indispensable if we wish to recognize accurately the depth and the location of such torn or contused parts when they involve these organs. It will be easy to determine that the lesions have been converted into ulcers from the reactions of the neighboring parts, from the severe subjective symptoms which arise, and also from the elevation of temperature.

Etiology.—Such lesions as we have been describing occur in the narrow, unyielding vaginas of old primiparæ and of women who have suffered for a long time from a severe inflammatory catarrh of the vagina, especially if the head is rapidly delivered; in stenoses of the vagina, which may in part be the result of cicatrices and in part be due to a narrowing by neoplasms and by congenital stenoses, and finally, in the case of congenital septa of the vagina (*Stein, Doherty*). The vagina may necrose in places if the head is wedged into the pelvis. In forceps operations, clean-cut incisions are produced on the anterior or posterior wall, on one or both sides, with the edges of the blades either by the over-elevation of the handles from the second into the first position, or in improving the transverse position of the head by rotation with the forceps. In general, this is done with one of the blades, usually the one which at the commencement was directed more anteriorly, *e. g.*, in a first vertex position the vagina is cut posteriorly on the right. These lacerations are 1–2 cm. long, 5–7 cm. deep and have sharp edges; if they are on both sides, the distance between them corresponds exactly to that between the blades. If a perineal laceration occurs during extraction, these lacerations are not always easy to distinguish, although they frequently exist. v. Franque found that ruptures of the vagina occurred, in general, just as often spontaneously as during operations. Bony splinters of the fœtal skull, resulting from perforation with the trephine, may also injure the vagina, and many lacerations of this kind may in former times have been produced by the use of the hook.

Prognosis.—The prognosis for small tears and contusions of the vagina is good; they heal at once, and are without any ill effects; at times lacerations several inches long heal rapidly, without being sutured, and without any reaction (*Schnakenberg*). The appearance of inflammation at the edges of the tear is, however, frequent, and now and then rectal and vaginal fistulæ develop from the ulcers which have arisen. If the reparative process is incomplete, fistulous tracts remain afterward, which may debilitate the patient by continuous suppuration. As a result of this chronic inflammation and thickening the roominess of the pelvis must be diminished and the subsequent deliveries may become dangerous for mother and child (case of *Mayer-Strassmann*). The same thing may happen if marked cicatrical narrowing of the vagina remains after extensive ulceration.

Treatment.—Small lacerations may be left to themselves, if they do not show any signs of suppuration. If ulcers form, direct applications to their surfaces must be made. These should be made through a speculum, and consist of iodoform, or undiluted liq. ferri sesquichloridi, which is applied with a small wad of cotton on the end of a stick. If, on the contrary, large lacerations exist, while the vagina is healthy, and the tear is discovered early enough, it is best to carefully reunite the edges of the wound with interrupted sutures as quickly as possible. In this operation Sims' speculum answers the purpose, and the patient is placed in the lithotomy position. Douches afterward are unnecessary unless the lochia becomes foul. The regular evacuation of the bowels and bladder should be attended to.

4. *Lacerations of the Vault of the Vagina and of the Uterus.*

LITERATURE.

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We have already described the anatomical condition of lacerations of the uterus occurring during delivery (see page 557).

Lacerations on the posterior half of the vault of the vagina may extend up to the peritoneum, and this be loosened over such a considerable area that portions of the child and the placenta lie under the peritoneum outside of the uterus. Such was the case in Waldenström's patient, in whom the rupture, 7¼ cm. long, extended through the fornix of the vagina and the cervix uteri up into the body of the uterus, without injuring the peritoneum. This patient died twelve days after her delivery. Lacerations of the anterior half of the vault of the vagina extend into the subperitoneal connective tissue between the bladder and the neck of the cervix. The peritoneal cavity is opened if the posterior wall of the uterus is perforated. In incomplete lacerations this cavity may first be opened into during the puerperium, in that the remaining thin layers of tissues are inverted from within outward into the uterus or the vagina, just as the fœtal sac is ruptured, by the pressure of the serum contained in it. The reverse of this also obtains:

a suppurating subperitoneal hæmatoma may perforate from without into the peritoneum.

Symptoms.—The case reported by Herbert Barker shows how insignificant the symptoms sometimes are, even after the most severe lacerations of the neck of the uterus. The lower uterine segment was torn off to the extent of 1½″, after which ischuria was noticed throughout four days; no pain at all, a moderate distention of the abdomen, and on the sixth day some metrorrhagia occurred; the patient made a complete recovery in twelve days.

The case described by Gontermann is very similar; here the bruised lower segment of the uterus had a thickness of ½–¾ cm., and measured 10 cm. across, with the os a little smaller than a silver dollar. The woman recovered in three weeks, and again cast off another slough eight weeks later. Pain is seldom present; it appears, however, if the bladder or the peritoneum are injured. Hemorrhages are more frequently met with, especially if the placenta was attached rather low or just above the internal os; many women bleed to death from such fissures. Extensive hæmatomata of the vagina and the external genitals are also found with these lacerations (*Kiwisch*). Hecker, in two cases of partial rupture, has felt the anterior vaginal wall pressed down by a soft, elastic tumor, which he proved in one of them, at the post-mortem, to be a *hæmatocele ante-uterina extra-peritonealis*; one of the cases described by Dohrn was similar. The development of streptococci in these lacerations and the contused parts frequently leads to the formation of ulcers with inflammation of the tissues around the lips of the cervix and the vault of the vagina. This inflammatory process may extend into the peri-uterine and peri-vaginal connective tissue and rapidly produce well-marked pelvic exudations. If, however, the tear is close to the peritoneum the most violent pains may suddenly occur, although the patient's condition has been good from the start, and be associated with meteorism, chills and fever; in a few hours a large peritoneal exudation develops. Persistent ischuria is frequently associated with lacerations occurring in the anterior vaginal wall and the anterior lip of the cervix. The ulcers which form may open into the bladder and the ureter by the extension of the destructive process, and urinary fistulæ be thereby produced. These, after destroying a portion of the lips of the cervix, very frequently heal with the formation of large cicatricial bands, which draw the portio vaginalis toward the vault of the vagina; stenosis of the vagina and cervix, and even complete atresia may thus arise. (Compare Credé, *Monatsschrift*, xv, 291.) Such cicatrices later on cause vague reflex pains, prevent coition and conception, and, therefore, result in a variety of disorders.

In the event of perforation of the vault of the vagina and the uterus, resulting from pressure or lacerations, attacks of fainting, vomiting, distention of the abdomen and a rather rapid diffuse peritonitis supervene upon the general collapse, which is usually present at the commencement, with cold extremities and a small, very rapid pulse. Peritonitis is only exceptionally absent, and cases have occurred in which the perforation of the uterus was unexpectedly discovered at the post-mortem (*Olshausen*). Severe metrorrhagia is by no means frequently noticed in the beginning, but may occur after a lapse of several days: on the fifth day in a case published by Young, and on the thirteenth day in a case reported by me; and this may cause death in a short time. At times, however, the hemorrhage never appears, because the blood escapes inwardly under the peritoneum, or the latter is perforated and it then passes into the peritoneal cavity. Such delayed hemorrhages in perforation of the uterus must be explained by the erosion of larger vessels as a result of the ulcerative process or by the washing away of a thrombus which has not become firmly adherent. Peritonitis may follow this discharge of blood and the patient rapidly die from suppuration. If an extensive opening of the peritoneum is formed, coils of intestine may escape through the wound into the uterus or vagina. They may here become constricted and gangrenous, thereby producing utero-intestinal or intestino-vaginal fistulæ. Braxton Hicks has reported a case, in which the physician, after a successful forceps operation, tore the uterus completely from its attachments in removing the placenta; he drew it out with the placenta and there was no inversion. Such injuries arise, as Michaelis has already shown, if the body of the uterus, in a narrow pelvis, retracts above the child, and, as the latter does not engage in the pelvic inlet, the neck of the uterus and the vagina are stretched to an extreme degree. Recoveries from a perforating rupture of the uterus have been observed by Stein, Eiselt, Colins, Bluff, Prael, Braun, Halder, Castelly, Ordinaire, Praessart, Bayne, Crighton, Cox, Whinery, and others. My father possesses a specimen of rupture of the uterus and vagina where recovery took place; the rupture occurred in a case of osteomalacia and extended through the posterior cervical lip and the vaginal vault up to the middle of the body of the uterus; a very fine linear cicatrix remained behind. This case, and others (*Hartmann, Kettler, A. Davis, Hartt*), show that even large lacerations may heal completely by first intention.

Diagnosis.—The deep lacerations of the cervix are not always easily diagnosticated, since the cervix immediately after delivery usually hangs down in a relaxed state below the contracted internal os. After several days have elapsed, when the external os is partly closed and the portio vaginalis has undergone some involution, cervical lacerations are more easily recognized by the touch; the same is true of lacerations in the vault of the vagina. The more extensive lacerations of the uterus are usually discovered at the time of delivery, and, if this is not the case, they are easily ascertained afterward from the collapse, and by the introduction of the hand into the vagina or of several fingers into the rectum. Kiwisch found several times after such lacerations extensive emphysema of the uterus, resulting from the entrance of air into the subperitoneal cellular tissue and the passage of air into the abdominal cavity. He considers the former to be a very important diagnostic point. In October, 1866, I felt such an emphysema after a perforation of the uterus. The diagnosis of a laceration of the uterine wall is positive if severe hemorrhages are found under the peritoneal covering of the uterus; these can be certainly distinguished by their well-marked fluctuation and by their firm attachment to this organ. If symptoms of intestinal incarceration arise, the whole hand or a part of it must be introduced as quickly as possible, in order to examine the rent and to reposit the incarcerated part.

The etiology of the lacerations here under discussion has already been sufficiently explained on page 558.

Prognosis.—Peritonitis is always to be feared in deep lacerations of the uterus and the vault of the vagina; if this does not soon occur, the prognosis on the whole is good. If ulcers are formed on the edges of the laceration and a parametritis is set up, the prognosis is decidedly better than in the event of a peritonitis having been lighted up, yet the convalescence is slow and deep cicatrices usually remain in the vault of the vagina. The occurrence of ischuria is unfavorable for recovery and is wont to be very obstinate. All penetrating lacerations of the uterus are very unfavorable. Ritter's computation, that about twenty-four per cent. of such patients recover, is rather too favorable. Death usually occurs very rapidly either during or immediately after delivery. If death does not result from internal hemorrhage, the rapid onset of peritonitis produces it in a shorter or longer time; or it is due to secondary hemorrhages in a later stage of the puerperium, resulting from an erosion of the larger vessels. To be sure, recoveries have been observed where extensive suppurating peritoneal exudations ruptured outward or through the vagina (*Creighton*); witness the cases of Trossat and Chéreau of rupture and subsequent prolapse of the intestine, and of Casamayor of recovery even after gangrene of the incarcerated intestine had set in. However, these cases are rare exceptions, which can scarcely improve the very unfavorable prognosis. In general, ruptures of the cicatrices of a Cæsarean section, unless the placenta is attached too near them, are the most favorable; and many a woman has been saved by a laparotomy after the escape of the child into the abdominal cavity (*Reild*, *Bayne*, *Hartt*, *Winckel, sen.*).

Treatment.—If we are convinced of the existence of a deep laceration in the cervix or the vault of the vagina, it should be closed at once with sutures of catgut, prepared in a sublimate or juniper solution. At the same time, cold or tepid applications should be made to the abdomen, to assist the contractions of the uterus and to abort any threatening hyperæmia of the peritoneum. As soon, however, as violent and lancinating pains and distention of the abdomen show themselves, the ice-bladder should be substituted for them, and allowed to remain over the uterus until the patient is free from fever, or is annoyed by it, provided its removal does not cause any increase of the pain. Apart from this, attention should be paid to clearing the bowels by an enema, or by small doses of calomel: 0.03–0.05 gm. three times a day, if the former fails. When a copious evacuation has been secured, a large dose of tinct. thebaicæ should be administered, in order to diminish the peristaltic movements as much as possible during the first few days. If ischuria supervenes, the catheter must be passed at least three times a day. If the lochia becomes offensive, antiseptic douches are to be given. In those cases in which ulcers form in the vault of the vagina or on the lacerations in the cervix, it is advisable to make applications of liq. ferri sesquichloridi to them every two or three days. How hemorrhages from such lacerations are to be controlled, will be considered in the chapter on metrorrhagia of the puerperium. If the patient should become collapsed, hypodermatic injections of ether (0.7 gm.), should be administered and repeated every ¼ or ½ hour; they are best given under the skin over the epigastrium, the sternum and the extremities. The above treatment is indicated and applies also to those cases of perforation of the uterus which are situated higher up; I must add, however, that all portions of the intestines and the omentum which force their way through the laceration must be reposited at once. Laparatomy has repeatedly been done in the case of such lacerations, and the edges of the wound pared and sutured; unfortunately, however, the result has always been unfavorable.

CHAPTER II.

Displacements of the Puerperal Uterus. Depression and Inversion of the Uterus in Puerperio. Depressio et Inversio Uteri Puerperalis.

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Anatomical Statement.—If a depression occurs on any part of the surface of the uterus with a corresponding projection into the uterine cavity it is designated as a depressio uteri, a sinking in or partial inversion of the uterus. This condition not infrequently arises from a *paralysis of the placental site*, as a result of which the thinned portion, corresponding to the insertion of the placenta, is forced into the cavity of the uterus by the more forcible contractions of the surrounding tissues and appears as a rounded mass on the inside; externally over this spot a funnel-shaped depression is to be felt. An incomplete inversion develops from this, if the depressed part increases in circumference and descends to the external os. In this event the uterine ends of the tubes are drawn down and the peritoneal pockets thus formed contain either or both of them; an ovary or a portion of the omentum or the intestines may be imbedded in it. If the uterus escapes entirely through the orificium externum and the cervix is inverted down to the external os, the inversion is then complete. Prolapse of the entire organ is frequently associated with this—inversio uteri completa cum prolapsu. If the inversion exists for a long time, adhesions may form between the two sides of the peritoneal pocket from the irritation of the peritoneum and the great hyperæmia of the constricted parts, and the cavity become completely filled up. Now and then these adhesions do not appear and the inverted tubes remain perfectly pervious. It appears almost as if this were usually the case, since, in more recent times, proportionately many cases have been reported in which reposition of this organ has been successfully performed after it had been inverted for many years, and this would scarcely have been possible if strong adhesions had existed. Erosions on the inverted body of the uterus, ulcers, and at times adhesions between it and the cervix and the vaginal walls result from the constant hyperæmia and swelling. If the organ is prolapsed at the same time, a tough, horny condition of the mucous membranes is developed, like that we frequently see in cases of vaginal inversion. Through the speculum the inverted part appears dark red and velvety, and contrasts markedly with the vagina on account of its pale appearance, the result of the hemorrhages. The uterine body is found in an atrophic state in old inversions. The fimbriated extremities of the tubes and the ovaries, at first, are usually markedly hyperæmic and œdematous, unless they themselves are inverted; here and there are to be seen small apoplectic foci. The location of the depression of the uterus, next to the placental site, is most frequent at the fundus.

Symptoms.—If the inversion of the uterus arises during or shortly after delivery, the patients frequently utter a loud anxious cry; are attacked with nausea and inclination to vomit; they become faint and sometimes are unconscious for a long time; have a cold face and extremities and become so weak, even if the hemorrhage is insignificant, that they can scarcely speak. If the placenta is still attached to the inverted part, the degree of the hemorrhage corresponds to the extent of its detachment. If it is still adherent over its entire circumference the bleeding may be entirely absent. As a rule, however, the hemorrhage is excessive and often jeopardizes life. At the same time there is an impulse to bear down and the patients notice that a tumor is escaping from the genitals. At the same time the pulse is small, very frequent, sometimes scarcely to be felt; the respiration is labored; the abdomen tense and painful to the touch; the patients are tormented with vesical and rectal tenesmus, with colicky pains and sometimes with retention of urine. The cases are very rare in which neither shock nor bleeding occur, in spite of a total inversion. Such cases have been reported by Robert Bell and J. C. Reeve. In the first stage of inversion the reposition often takes place spontaneously, and it is even possible that a complete inversion can be spontaneously reposited. If it arises more slowly the women complain of severe after-pains, lose a great deal of blood, and have much pain in the back, hips and thighs. The hemorrhages are continuous or return at frequent short intervals. Any exertion increases them considerably, and the patients become rapidly anæmic. If this condition continues, involution of the inverted portion of the uterus usually takes place by degrees, and the tumor, at first as large as a child's head, slowly assumes the size of a pear. Brosse measured the length of an inverted uterus on the fourth day post partum, and found it 5½ inches, the greatest circumference 12 inches; on the sixteenth day, however, the dimensions were only 3½ and 8½ inches respectively. In this way the constricted tubes and ovaries may again be freed. In rare cases the constricted uterus becomes gangrenous, and the patient dies of this gangrene unless timely aid is rendered. Clemensen had a case in which the patient recovered after the inverted gangrenous part of the uterus had sloughed off. The most instructive case of recovery is the one described by Spiegelberg, in which reinversion occurred about ten weeks post partum, in connection with a violent diarrhœa and without any other means. Spiegelberg and Schatz assume in this case that the round and broad ligaments had slowly accommodated themselves to the low position of the fundus uteri and become shortened; that with the occurrence of the diarrhœa the abdominal pressure, which, during the efforts of straining, was exerted with a force of 1 to 1.5 m. of water, could, therefore, have forced the anterior and posterior vaginal walls violently downward; the fundus uteri, however, could not be acted upon to the same degree, as it was fixed by the above-mentioned ligaments, and was thus drawn up by them out of the vagina.

The patient dies frequently of exsanguinating hemorrhages, as well as of the exhaustion which is associated with extensive stretching and tearing of the peritoneum and other displaced tissues. Even after successful reposition, peritonitis and severe bleeding may occur. The small, thread-like, often imperceptible pulse, collapse, attacks of syncope which occur even without hemorrhages, the restlessness and anxiety, and, finally, the rapid death without any considerable lesion of the genital organs, make it highly probable that the vasomotor nerves of the veins or the heart, either directly from the spinal cord in a reflex manner or indirectly through the vasomotor centre of the medulla oblongata, are paralyzed from irritation or compression of the sympathetic fibres of the uterus and the tubes.

An especially clear example of this form of death has been reported by Braxton Hicks: spontaneous delivery without assistance. Severe hemorrhage and vesical tenesmus set in, the patient raised herself up, whereupon the uterus appeared inverted between the labia, and the woman died within a few minutes. Merriman reports another case from the practice of Dr. Edward Smyth. Here the patient died sixteen hours post partum, after the pulse had been imperceptible for some time, without having uttered a sound; without having had any fainting spells, delirium or sudden gush of blood.

Other causes of death are: peritonitis, exhaustion, septicæmia, anæmia, pyæmia with abscesses of both ovaries (*Hofmeier*). The supposition of Olshausen, that the cases of sudden death in inversion of the uterus are partly dependent upon the entrance of air, appears to me more venturesome than the hypothesis just given; for the veins not only are greatly compressed by the inversion, but also bent at the inverted spot; thereby greater obstructions are opposed to the entrance of air into the pampiniform or utero-vaginal plexus than in the non-inverted uterus.

Diagnosis.—When in a puerpera symptoms of such a threatening character as those just described appear, we shall, of course, examine the genitals at once, and then feel through the abdominal wall whether the body of the uterus presents at any one point a more or less deep depression surrounded by a round, elevated, resisting swelling (similar to the bottom of a wine bottle); or whether it is entirely wanting, and instead there is only a cup-shaped depression. On examining internally, we feel a round, sensitive tumor in the os uteri, or it is seen projecting from the vagina.

If the inverted uterus has prolapsed and the placenta is still attached, error is scarcely possible; and yet, in a case of Römer, a surgeon tore away the uterus together with the attached placenta, mistaking it for a fibroid (!). The diagnosis is more difficult when the affection is of some days' standing, and the abdominal wall so tense that palpation can be done only with difficulty. In these cases the sound must be used for the examination. If the uterus is inverted, the instrument passes up on all sides between the os uteri and the questionable body only ½ to 3 cm. Beside this, we may sometimes inform ourselves by drawing down the tumor, since, in recent complete inversion, the still existing external os then disappears, to reappear again on relaxing the traction. Examination per rectum with two or four fingers must never be omitted; for when all other measures have left us in uncertainty, this may still enable us to make a positive diagnosis. In it we miss the body of the uterus, and feel instead the funnel-shaped opening from above. We thereby avoid confounding the condition with a polypus of the uterus, which has repeatedly happened even in recent times. Much importance is also attached to the tenderness of the tumor when scratched. On the other hand, its color, hyperæmia, and bleeding when touched, have only slight importance as diagnostic factors. Scanzoni has called special attention to the broad band composed of the tubes, ligaments and vessels, to be felt above the vault of the vagina. Sometimes it is possible, with a speculum, to detect on the inverted uterine body the openings of the tubes as small dimples with elevated borders.

Etiology.—Inversion occurs very rarely in the puerperium. Numerous reports of such cases find their way into all the journals only because the affection is so rare. I have myself observed several cases of undoubted depression of the uterus, but not one inversion in more than 17,000 deliveries. Denham found only one acute inversion among 100,000 deliveries in the Dublin Rotunda. C. v. Braun, however, had not a single case in 250,000 deliveries. Three factors must coöperate in the origin of this condition, viz., traction on the inner surface of the uterus, pressure upon the fundus from above, and disease or relaxation of the uterine muscular structure. According to Duncan, the uterus is said to be always paralyzed or at least atonic. The accident most frequently arises immediately after the expulsion of the child, before or after the removal of the placenta. However, the cases are not rare in which it occurs gradually some days afterward (*Malino*). The following have been ascertained as causes:—

1. Dragging on the placental site by means of the cord, whether it be the result of absolute shortening or coiling, or of attempts at removal of the placenta; in the latter event, an unusually firm adhesion of the placenta to the uterine wall must be assumed. The origin of inversion in this manner is probable in 25 per cent. of the cases. In a case of Woodson, the half-delivered woman on her way home appears to have inverted the uterus by dragging on the fœtus (see page 358). Dyrenfurth caused a partial acute inversion of the uterus in extracting a child with a cord 3½ cm. long, which tore during the operation.

2. Violent efforts at straining, associated with sudden emptying of the uterus (precipitate labor, severe straining and pressure in the removal of the after-birth). Kulp noticed, in a woman (delivered of twins) with a thin-walled uterus, how, when the patient in the attempt to remove the placenta suddenly turned on her side, the fundus of the uterus quickly disappeared from under the hand with the escape of the placenta, and he could feel it in the external os by internal examination. In like manner, Madge observed an inversion arise from a midwife's pressing forcibly upon the fundus between the pains.

3. Inversion in the puerperium may arise in a chronic manner from a faulty involution of the placental site, especially if this is rendered prominent on its inner surface from adherent coagula (placental polypi).

4. In the cases where all of these factors are absent, a faulty contraction of the uterus is assumed, whereby the contracting and descending fundus forces itself through the quiescent and relaxed cervix.

In all of these causes it is presumed that the condition of the cervix is such as to offer little or no resistance, that is to say, is relaxed; otherwise only an incomplete inversion could be produced even by the greatest external force. At the same time the uterine cavity must have a certain size, at least for the acute occurrence of the inversion. Inglis believed that in his case an unusual presentation of the head, which remained for a long time in the same position, may have been the exciting cause, since it first of all stretched the cervix enormously, thereby exciting the most powerful contractions, and the latter at the termination of labor may have inverted the body of the uterus into the cervix. Tyler Smith felt an inversion occur while he had his hand on the already well-contracted fundus uteri. He therefore assumes an antiperistaltic action of the uterus, and emphatically states that simple relaxation cannot always be blamed for it. Duncan distinguishes a spontaneous and an artificial inversion, each of these he again divides into active and passive. Spontaneous active inversion is said to happen in paralysis of the whole fundus or a portion of it, especially the placental site, since this part, sinking down into the cavity of the uterus, is grasped by the contracting portions, drawn down and forced through the os uteri. Spontaneous passive inversion occurs in atony of the whole uterus. Artificial active inversion may be wholly like the spontaneous active variety, only that the designated parts are forced downward by pressure from above or traction from below. Finally, the artificial passive inversion is the variety ordinarily described by authors. The most frequent are the spontaneous active and the artificial passive. Inversion occurs chiefly in multiparæ, but often also in primiparæ. It is worthy of remark that one and the same woman may be repeatedly affected with inversion after several deliveries, as is shown by Kühlbrand's and Crosse's cases.

Prognosis.—The condition is in the highest degree serious and may be followed in a short time by death. Crosse (1847) found this to be the case 80 times in 109 cases; in 72 of them a few hours after labor. Among 54 more recent cases, however, death only occurred 12 times; from which it appears that with the ever-increasing improvement in the art of midwifery this disease has lost some of its terrors. The prognosis is much better if the accident is at once recognized, because reposition then is easiest and most certain, and hardly any evil after-effects are to be feared. Thus many cases are published in which a speedy recovery has taken place after immediate reposition, in spite of the presence of the most alarming symptoms. The longer the inversion lasts, so much the less is the direct danger to life, for women will endure profuse hemorrhages even for years. The chances of a complete cure, however, become progressively less, and in the end the amount of the woman's suffering frequently becomes so great that she prefers to submit to the dangers of an extirpation. Successful attempts at reposition in cases of several years' standing are reported by White (½ year), Sims (1 year), Schröder (2 years), Birnbaum (2 years), Author (4½ years), Bockenthal (6 years), Tyler Smith (12 years), Noeggerath (20 years).

Spontaneous reduction does occur, as a case of Shaw proves, by the use of antispasmodics (opium and chloroform) even after vain attempts at reposition have been made; and when replacement is impossible immediately after the occurrence of the inversion, it may be successfully done and without any difficulty if the attempt is repeated after the lapse of several weeks.

Treatment.—While many authors reposit the inverted uterus with the placenta still attached to its wall and afterward deliver the latter, others assert that the placenta must first be removed, for reposition is materially interfered with by its size and weight. Besides, hemorrhage after peeling off the placenta is not considerable, since the inversion of the uterus would compress the blood vessels. There are, however, successful cases in which reposition has been done while the placenta was still attached. Since a new inversion may arise during the separation of the placenta (case of *Reeve*), it will be much better to detach it beforehand; the seizure of the uterus is thereby made much easier.

Reposition is done as follows: The prolapsed uterus is first forced into the vagina; then the right hand, well oiled, is introduced, and the fundus uteri grasped with the whole hand and compressed on all sides. We try to squeeze it like a sponge, and then, the left hand lying on the abdominal wall above the symphysis, press the body of the uterus upward through the os, in such a manner that the parts situated in the external os are the first to be reposited with the ends of the fingers. In replacing the part, the body of the uterus sometimes springs back suddenly. We must afterward prevent a new inversion by stimulating the uterus to contract. Contractions are produced and hemorrhage prevented by firmly grasping the fundus of the uterus, by kneading it, by intense cold (ice bladder on the abdomen, as well as by the use of a colpeurynter filled with ice water), or by hot injections into the uterus (*Smith*), and by the hypodermatic use of ergotin up to 0.1 gm. in an hour.

If reposition fails despite repeated careful attempts, we introduce the colpeurynter into the vagina, after pushing back the prolapsed uterus. Thereby we exert a continuous pressure against the fundus of the uterus, which in itself has frequently effected reposition (cases of *Bockenthal, Tyler Smith, Byford, Jaggard, Schröder*, the author, and others). If the inversion is incomplete, the colpeurynter must be pushed into the cervix, or introduced into the vagina, and from time to time distended more and more, thereby increasing the pressure. Chadwick's method is also worth recommending: First, to introduce into the vagina a large elastic ring, which is inflated with air, and rests firmly upon the perineum; then, through it, to push a colpeurynter up under the fundus uteri, and, by over-distending this, to exert considerable pressure upon the latter. Hamon's case is interesting, in which spontaneous reposition took place, apparently because of over-distention of the rectum with hard, stony scybalæ. In inversion of long standing, chloroform is said to be of service in the reduction. Against persistent hemorrhages, the styptics, mentioned further on, are to be used in their order. Martin, in Orleans, effected a permanent cure in twelve days with the cold douche. Some authors assert that they have successfully used in old cases of inversion, sounds with an olive-shaped head (*Siebold, Borggreve, Smart, Champion, Woodson* and *Birnbaum*). In some of the examples described, the slipping back of the uterus did not take place during treatment with the sound, but while the colpeurynter remained in the vagina. Denucé advises, in case reposition be impossible in the puerperium, to let the woman nurse her child, since lactation controls the hemorrhages during its entire course.

The treatment of chronic inversion of the uterus does not concern us any further. For the puerperal uterus Lauenstein's procedure to prevent reinversion after reposition is naturally unsuitable; he pushes a rubber tube the size of a finger with lateral fenestræ into the uterus, and affixes it to the anterior and posterior cervical lips by a silk suture; the widely gaping os uteri is then closed by lateral sutures. Tamponing of the uterine cavity with iodoform gauze (*Krukenberg*) is not to be recommended in these cases.

CHAPTER III.

Hemorrhages from the Genitals in the Puerperium.

(*a*) *External Hemorrhages.*

LITERATURE.

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Location and Causes.—Hemorrhage from the external genitals springs either from perineal lacerations or from lesions of the mucous membrane close to the clitoris and adjoining the urethral orifice. Unless recognized in time, the profuse hemorrhage from a laceration of the mucous membrane below the clitoris may quickly terminate fatally. Kleinwächter was of the opinion that the frequency of such cases in the practice of some physicians might perhaps be due to certain manipulations in the treatment of the perineum. The latter may be pressed too hard, thus crowding the head against the pubic arch; or else, forcing down the occiput may cause a laceration of the anterior commissure (?). Klaproth repeatedly witnessed considerable venous hemorrhages from such injuries. In cases of perineal lacerations, important venous hemorrhages occur only in about three per cent., arterial bleeding is ever rarer, and rarer still are hemorrhages from ruptured varices of the vulva (*Atkinson*, *Berthod*).

Hemorrhage from the vagina may be due partly to lacerations, partly to ruptured varices, but may also be caused by the presence of ulcers. The lesions first mentioned are liable to occur in any portion, the last have their seat usually either in the lower or upper portion of the vagina. Laceration of a vein is very rare: among 12,612 labors Sickel met with but two cases of ruptured varix in the vagina. Streng, on the other hand, observed six cases among 2936 labors. The hemorrhages associated with vaginal lacerations, with or without implication of the neighboring organs, have been discussed above. Vaginal hemorrhages, like those of the vulva, generally occur shortly before or immediately after the termination of labor, according to their cause. In rare cases they first appear some days or weeks after delivery. They may be secondary, if due to the rupture of a vaginal thrombus.

Hemorrhage from the uterus is much more frequent. It may spring either from lacerations—*e.g.*, deep lacerations into the os, especially when the placenta is previa or has a low implantation, also from lesions of the cervix or body of the uterus—or issue from the vessels at the placental site. The latter hemorrhages are the most frequent and are conveniently divided into: those occurring within the first few (8–10) days, and those of a later period, so-called late puerperal hemorrhages.

Etiology.—One of the most frequent causes of hemorrhage in the third stage of labor and immediately after delivery—faulty contraction of the uterus—is met with partly in the form of irregular contraction in consequence of exhaustion during labor, *e.g.*, after precipitate labors, excessive distention by twins, hydramnios, or as a sequel of weak and also of cramp-like pains. Great losses of blood and protracted exertion during labor may likewise give rise to it. Since atony of the uterus also impairs its involution, the hemorrhages which occur immediately after labor are frequently followed by late hemorrhages, after the ninth day. The metrorrhagia due to atony, particularly paralysis of the placental site, is usually very profuse; that occurring with irregular contraction is less so. At times, too, the atony is merely partial, confined solely to the placental site.

In almost ten per cent. of the cases, retained remnants of the membranes and the placenta are the cause of the hemorrhage, which as a rule occurs within the first eight days, rarely later. Remnants of the afterbirth hinder the contraction and normal diminution of the vessels at the placental site. Its sloughing, and the decomposition of remnants of the membranes, may also give rise to the destruction of previously formed thrombi, and hence to the reopening of vessels that had been closed.

Sloughing, however, depends not alone upon the placental remnants, the blood they contain, their connection with the uterine wall, and apoplectic foci within them, but also upon irregular contraction of the uterus, disease of its inner surface, affections of other organs, and particularly the penetration of cocci. For vigorous contraction of the uterus prevents the accumulation of fluids within it; shortens the duration of their influence upon the openings of the vessels; and at the same time guards against the absorption of deleterious substances by compressing the latter. When the retained remnants are small and the contractions vigorous, the hemorrhage may be slight; but it is often abundant when the contractions are feeble or absent, even when the retained remnants are minute.

The hemorrhage may be due, furthermore, to subinvolution of the uterus. In this connection, the placental site, as a rule, is the least involuted, the vascular lumina are not yet firmly closed, they are not subject to strong pressure, hence often slight physical and psychical excitations suffice to augment the passive hyperæmia previously present and to reopen in part the closed vessels; such defective involution may be demonstrated in nearly 30 per cent. Usually it affects the anterior or posterior wall of the uterus; more rarely the involution of the entire organ is uniformly retarded. Hemorrhages of this nature generally ensue after the eighth day, are slight in amount unless provoked by strong irritations, but continue for some time.

Changes of position and shape of the uterus cause hemorrhages partly by compression of the venous plexus of the lesser pelvis, partly by direct interference with the venous efflux from the uterus, and by retarding involution. In either case the hemorrhage comes from the placental site, occurs as a rule after the ninth day, since pronounced displacements are not effected until then, by greater exertions; only exceptionally they occur earlier. Inversions of the uterus as causes of profuse hemorrhages have been mentioned above In one case I observed a profuse after-hemorrhage from the uterus on the third day in consequence of an ovarian cyst of acute origin which dragged the uterus upward and prevented its contraction.

Diseases of the endometrium and affections of the os uteri are among the rarer causes. Endometritis may lead to hemorrhages partly by the hyperæmia associated with it, partly—especially the mycotic form—by erosion of previously closed vessels at the placental site, partly secondarily, by the subinvolution occurring in its train (*Gaunt*). Granulations and ulcerations of the os are at times the seat of slight hemorrhages if they be subjected to friction against the vaginal wall when the patient leaves the bed, particularly because they are then usually more hyperæmic than in the horizontal position. Mikschik (*Wiener Zeitschrift*, x, 6, 1854) reports a rare case of fatal hemorrhage from erosion of a cervical artery, the size of a raven's quill, by an ulcerated surface about as large as a dollar.

Very frequently, however, hemorrhages are caused by premature excessive abdominal pressure, particularly in the later days of the puerperium. Of our parturients, 16 per cent. suffered a loss of blood on the ninth day, and it occurred simultaneously with or soon after first leaving the bed. Two causes are here coöperative—the inevitable greater pressure on the uterus with its displacement, which weakens its contraction and disturbs its circulation; and the venous stasis which is bound to occur in the valveless internal spermatic veins when first rising from the prolonged dorsal decubitus. A reflux of the blood ensues, the hemorrhage is venous, comes from the placental site, and is often so profuse that the blood escapes continuously and the patient faints. In the same way a stubborn bronchial catarrh may produce protracted losses of blood from the uterus.

Retention of urine, overfilling of the bladder, rather frequently gives rise to an after-hemorrhage, mainly in the first few hours following delivery. It is brought about in this way: the filled bladder crowds the uterus out of the lesser pelvis upward and to one side, usually the right; it interferes with its circulation and hinders its contraction, and, by filling the conjugate of the pelvic inlet, it compresses the os. Thus it partly impedes the efflux of the blood, and the latter accumulating in the uterus distends it. This result, however, can only be effected when the contraction of the uterus was previously defective; still, its contractions may be vigorous and yet coagula may accumulate in its cavity during relaxation and fail to be expelled even by powerful after-pains. When the bladder is emptied the uterus often contracts at once more powerfully and expels such clots. As a rule, when this cause obtains, external and internal hemorrhages coexist. Should the ischuria persist for several days and lead to frequent recurrence of these hemorrhages, the latter, with the impeded contraction of the uterus, will lead to subinvolution, and thus may become an indirect cause of late puerperal hemorrhages. I am compelled to maintain this view in spite of the opposite opinion advanced by Pfannkuch. In an analogous manner, overfilling of the rectum with fecal masses gives rise to metrorrhagias (*Cloete*).

Finally, mention should be made of the cases in which the uterine hemorrhage occurs during a chill, while none of the above-mentioned or other causes can be discovered. It appears to me quite probable that, during a severe rigor such as occurs in the puerperium with the most different affections of the genitals, owing to the congestion of the internal organs, a hemorrhage may spring with great facility from the placental site, since for at least four weeks it offers less resistance than a firmly cicatrized spot. This explains also how defective involution of the uterus occurs frequently in the train of such affections. Besides the causes named, the following have been enumerated by other authors: Relaxation of the vaginal portion of the cervix with loosening of the mucosa while the uterus is well contracted (*von Helly*). Louis Chapel performed an autopsy on a woman who, having a firmly adherent placenta, had died of a metrorrhagia which had come from the spot where the umbilical cord had been torn off. Violent emotional excitement has been mentioned by some authorities even in the later days of the puerperium; I have met with but a single case in which such a cause appeared probable, at least I was unable to demonstrate any other cause with certainty.

Symptoms.—Vigorous, plethoric, healthy parturients bear a loss of blood to the amount of 1500 gm. without particular ill effects. At most we observe some pallor of the lips, cheeks, and the conjunctivæ, and some acceleration of the pulse. The temperature is, however, by no means lowered, and does not always fall even after profuse hemorrhages. When the blood escapes freely, the patient notices its flow, and at times experiences a sensation of ascending warmth. But in debilitated persons and those weakened by prolonged exertion during labor or by antecedent hemorrhages, and if the loss of blood is profuse and sudden, the symptoms of anæmia manifest themselves soon in widely differing degrees: coldness and pallor of the face and the extremities, nausea, choking, cold sweats, restlessness, anxiety, oppression, efforts to assume a lateral position in order to facilitate respiration, vomiting, tinnitus aurium, swimming before the eyes, loss of consciousness, fainting fits, and, finally, death with or without convulsions. Thus, women may die in a few hours of hemorrhage from ruptured varices (*Helfer*), vaginal ulcers, (*Lehmann*), after labor with placenta previa, rarely after ruptured thrombi of the vulva and vagina, and in atony of the uterus immediately after labor.

If caused by subinvolution or changes in the position and shape of the uterus, the hemorrhages are very rarely profuse; but they recur frequently, and slowly make the patient anæmic without the appearance of alarming symptoms like those named above. The only associated symptoms usually are: debility, profuse sweats, anorexia, tendency to constipation, and temporary swelling of the feet.

Altogether different are the symptoms occurring with retained remnants of the placenta; they are, particularly, hemorrhages which appear, as a rule, early, but not rarely also after the fourteenth day, and are associated with labor-like pains, uterine colic, sacral and abdominal pains, and vesical tenesmus. On internal examination we find the cervix and os uteri open, the vaginal portion obliterated, and subinvolution of the uterus.

The effect of great losses of blood upon the uterus is always very deleterious, since they prevent its contraction; its walls are relaxed, their involution is thus retarded, and a tendency to versions and flexions is induced. Both of these causes easily give rise to chronic catarrhs of the cervix, and this occurs the more readily when the blood has been directly withdrawn from the uterus. The congestion of the breasts is usually diminished, the secretion of milk is scanty, and the mammæ therefore remain flabby.

It is difficult to determine the influence of profuse hemorrhage on the temperature of the parturient because of the general co-existence of complications (lesions, inflammations and ulcers). But in several cases in which repeated local examinations failed to show any disease of the genitals, I have found for several days great rise of temperature up to 103° F., which was associated with slight general symptoms and gradually declined. It appeared to me as if this occurred mainly with the diminution of the profuse sweats common in anæmic patients, and in one of these cases I repeatedly observed that the fall of the temperature set in with abundant secretion of urine, and subsequently, too, diuresis was ample when the temperature was low. Abnormal frequency of the pulse, hurried respiration, and considerable dilatation of the pupil are said to be very important signs (*L. Earle*).

One symptom which is often met with in anæmic parturients is violent headache. But this has no specific character, and is found likewise in other patients suffering from anæmia; it manifests itself sometimes as a sensation of emptiness, dullness, and vibration in the head, sometimes as hemicrania. Rheumatic affections of the scalp can be assumed only when pressure on the cervical and occipital nerves is painful and other rheumatic symptoms are present. The time when the headache occurs varies. Kyle describes the headache as oppressive and continuous and most violent in the evening and at midnight. The small, frequent pulse at the same time is said to become fuller, more rapid and harder, the dull eyes become brighter, at times photophobic, the carotids throb, the tongue is broad, pale and has a white coating, and great thirst is present.

Diagnosis.—A hemorrhage from an injury to the mucous membrane below the clitoris, from a ruptured varix of the vulva and from perineal lacerations will be easily recognized on local examination. When the nymphæ are separated, the spirting vessel is often seen at once; and in every case of hemorrhage immediately after labor, the fundus uteri should be first grasped, and when convinced of its contraction, the external genitals should then be inspected. But if all parts of the vulva are uninjured and the uterus well contracted, the hemorrhage may come from the vagina, the os or the cervix. Therefore, we must next examine with the finger whether lesions of the vagina or os are present and whether the blood escapes from these. Should digital examination fail to give us the desired information, a speculum must be introduced and every part of the vagina carefully examined; the source of the hemorrhage is thus sometimes found and can be arrested. When the hemorrhage springs from the placental site, either the entire uterus is relaxed, large and yielding, or only the placental site is softer than the other parts of the walls. The hemorrhage moderates when the uterus remains contracted, and again increases when the contraction ceases or with the onset of the after-pains. If retained remnants of the membranes and placenta be the cause of the metrorrhagia, the os uteri will be found open; at times it is possible to feel directly the membranes or portions of the placenta hanging from it. Should this not be the case, repeated examination will lead us to suspect abnormal contents of the uterus, owing to the reopening of the os and the renewed obliteration of the vaginal portion which had already been formed. Besides, these hemorrhages are at times very profuse and then again disappear for some days. If over-filling of the bladder be the cause of the hemorrhage, we find an oval elastic tumor in the median line above the symphysis, and adjoining it to the right or left above, sometimes above the navel, the fundus uteri, which can be depressed and made harder by friction. The position of the fundus uteri, above the umbilicus is always an important indication that the organ has been displaced from the pelvis or is distended by abnormal contents. In order to differentiate hemorrhages from granulations of the os from after-hemorrhages due to displacement and subinvolution, the speculum may be inserted and the lips of the os everted by pressure against the cervix; it will then be easy to recognize whether the blood comes from the uterine cavity. Subinvolution of the uterus may be diagnosticated when the fundus, especially in primiparæ, can still be felt above the symphysis after the tenth or twelfth day of the puerperium. Frequently one of the lips is thicker than the other, and so is the wall of the uterus corresponding to it. Moreover, there are some cases in which it is only possible to recognize the inner surface of the uterus as the source of the hemorrhage, but its location and causes—whether from injuries, retained remnants of the placenta or ulcers—cannot at first be definitely determined. In proof of this we may cite a case described by Hecker, in which there was found after death a cicatrix the size of a dime on the anterior surface of the cervical canal, together with a fibrinous plug situated in an enormously ectatic vessel.

Prognosis.—The loss of blood in displacements and subinvolution of the uterus is generally slight; hence the prognosis varies with the cause of the hemorrhage, and in these cases is not bad. The same is true, as a rule, of the metrorrhagia due to ischuria; when the latter is removed the former decreases; of course, the prognosis is worse when the loss of blood affects women already debilitated. The hemorrhages are more dangerous when they are profuse and sudden than when slight and prolonged; for small and gradual losses are often borne surprisingly well by female patients. Sudden death after very profuse hemorrhages occurs not rarely as a consequence of placenta previa, after rupture of varices, and in debilitated patients with total atony of the uterus. In this condition, as Olshausen points out, the possibility of the admission of air alongside the examining hand into the open vessels at the placental site must be borne in mind as a cause of death. Furthermore, the prognosis is more unfavorable with hemorrhages due to retained remnants of the placenta, because they will not cease until the latter are removed and septicæmia may result from their retention. It has been abundantly proven that great losses of blood predispose to the gravest affections in the puerperium. This will be readily admitted, for they relax the uterus, impede the involution of the placental site, favor the occurrence of thrombosis by dilatation, and increase the possibility of infection, even in the later days of the puerperium. Nor should the danger be lost sight of, that by the frequent introduction of the hand for the purpose of arresting the hemorrhage germs of infection may easily be carried into the uterus. On the whole, numerous other causes require consideration; for even when remnants of the placenta remain in the uterus, it is not in every case that profuse hemorrhages, sloughing or septicæmia occur: the source of the hemorrhage, its cause, and the previous condition of the patient determine the importance of a loss of blood often to a greater degree than its amount. In hemorrhages from the external genitals, if recognized early, the prognosis is good; less so are those springing from the vagina, because the bleeding point is more difficult to find and not so easily compressed. Of the uterine hemorrhages, those due to disease of the endometrium are usually of slight importance; the fundamental affection determines the prognosis; in atony, later hemorrhages are more to be feared than in irregular contractions of the uterus, and the loss of blood in the former is generally greater.

Treatment.—If arterial vessels of the external genitals are injured, they must be seized with forceps and ligated. In laceration of the mucous membrane below the clitoris ligation is not always easy, hence the wound may be closed with a few catgut sutures, but even this is not often necessary; a pledget of cotton the size of a walnut dipped in vinegar or solution of chloride of iron suffices to arrest the hemorrhage; it must be firmly pressed upon the bleeding point and held there for fifteen to thirty minutes. After the hemorrhage has ceased, the patient may be allowed to remain quiet with thighs in apposition, and the cotton will fall spontaneously on the first or second day of the puerperium. Should the liquor ferri sesquichloridi be employed for stilling the hemorrhage from these lesions of the mucous membrane between the clitoris and the orifice of the urethra, it is possible that the scab caused by it covers the meatus urinarius so completely that the catheter, if required, cannot be introduced, despite the best illumination and palpation of the part. Any attempt to pass the catheter in the direction of the urethra may again give rise to considerable hemorrhage and make the opening still harder to find. In such cases, in order to prevent making a false passage, catheterization must be abandoned, pledgets of cotton dipped in vinegar be pressed on, and the time awaited when the scab will fall off and the urethra be found. To guard against this disagreeable consequence, liquor ferri sesquichloridi should either not be used at all for this purpose, or else but a small pledget applied, the size of which must be carefully gauged and the position of the urethra exactly located in the application. Another disadvantage connected with the iron solution is that fragments of the scab may be carried into the bladder with the catheter.

Hemorrhages from varices of the vulva and vagina may be arrested by pressure and direct application of styptics. A pledget of cotton with liquor ferri is pressed for some time against the bleeding spot and subsequently fastened with a T-bandage; in the vagina it is held in place by tamponing with cotton. At times pressure with the finger for fifteen to thirty minutes or compression with the pledget suffices for these bleeding varices. Where this fails and the hemorrhage is not too high up, the bleeding point may also be compressed with the finger simultaneously from the rectum and the vagina. Bleeding vaginal lacerations require cold injections into the vagina; if this fail they must be sutured.

Against the various hemorrhages from the uterus, numerous measures have been recommended. With reference to treatment, the uterine hemorrhages occurring in the first days of the puerperium may be divided into three groups: 1. Hemorrhage from the uterus when the *organ is completely relaxed.* Here contraction must be stimulated in every possible way. Internally, ergot must be given, 0.3 gm. every fifteen minutes, or 0.05 gm. hypodermically at the same intervals; locally the fundus should be rubbed with the hand. Hubbard recommended that the patient be put in a semi-recumbent position and the uterus uniformly pressed against the lower iliac fossa; the application of cold compresses to the abdomen is of little use in profuse hemorrhage and interferes with making effective compression. Ether spray, recommended by Broadbent, may be tried in the intervals. Another useful measure is hot vaginal irrigation (117.5–128.75° F.). Compression with the hand is preferable to all other methods, while the sand-bag and the tourniquet (*Pretty*) are to be altogether rejected. If the atony be due to exhaustion during labor or other conditions of weakness, it is advisable to combine ergot with roborants, especially red wine in large doses (one to two tablespoonfuls every five to ten minutes). As powdered ergot is disagreeable to many and causes vomiting, it may be given in infusion (15 : 175 gm.), a tablespoonful every fifteen minutes, or the aqueous extract (2–4 : 180 gm.); the former may or may not be combined with acids and syrup of cinnamon. Of the preparations of ergot recommended by Kobert, the hydrochlorate and citrate of cornutin seem to have the greatest effect on the uterus, and might be given in pills of 0.005 gm. several times daily, as Erhard has done, with certain or probable effect, in 63 per cent. of cases of weak pains. Ice water or pellets of ice internally, and the ice bladder to the abdomen, are also useful. If the uterus remain relaxed in spite of all these measures, and the hemorrhage continue, styptics must be applied directly to the bleeding endometrium. Among these are the introduction of pellets of ice into the uterine cavity and injections of astringents into the uterus. The introduction of ice into the uterus, recommended by Seyfert, has often been used with success; but it is not necessary, as Betz claimed, that the ice should be in pieces so large as to almost fill the uterus; as a rule, smaller fragments, about the size of a walnut, suffice. Still better are hot injections to the amount of 1–2 litres into the uterine cavity (*Hervéon-Tarnier, Paget, Regnault, Richter*). In cases where even these fail, equal parts of chloride of iron and water may be used. This mixture may be injected slowly with Braun's syringe, but it will be resorted to only when all means have failed and danger threatens. Schreier, in 1854, made use of a sponge tent with chloride of iron. Williams applied it by means of a sponge, tied to a string, which was left for some time in the uterine cavity. Braxton Hicks made use of the same drug, especially after delivery in placenta previa, in order to obtain better contraction of the placental site (see also *Binet*). I have had no experience with injections of tincture of iodine, recommended by Dupierris in 1857 and again in 1870, and by Noeggerath in 1861 (1 part to 5 of water; or, according to

Dupierris's latest directions, water 30, tincture of iodine 15, potassium iodide 5 parts).

As regards compression of the abdominal aorta for the arrest of these hemorrhages I share the views expressed by Spiegelberg in 1858, despite the recommendations of Braun, Cazeaux, Jacquemier, Chailly-Honoré, Dubois, and notwithstanding Fleury has ascribed favorable results to this method. It should be attempted only from without, and the compression should be made above the point of origin of the internal spermatic artery. Care must be had lest the inferior vena cava be compressed at the same time, nor should too much time be wasted with these experiments. Recently, compression of the aorta continued for hours has been again urgently recommended, not only because it induces uterine contractions, but because it prevents the impending anæmia of the brain (*Schmidt, Léon Gros, Chase, Berenger-Feraud*, and *Demagny*).

Friction of the internal surface of the uterus with the hand in order to excite contractions is a measure of last resort; better is the procedure of Hamilton, Hubbard and Fassbender—to compress the uterus vigorously from without and within. Electricity is seldom applicable in private practice, as time is lost in procuring the apparatus. Tamponing the vagina with cotton or with the colpeurynter filled with ice water is insufficient and injurious in the most profuse hemorrhages; at most, it will change the external into an internal metrorrhagia, and is suited only to certain cases, to be mentioned hereafter. Ischuria associated with overfilling of the bladder requires the introduction of the catheter. In cases of profuse metrorrhagia it is not wise, as Rigby advised, to put the child at the breast soon after labor, since this cannot be done without disturbing the patient, and absolute rest is one of the most important conditions in the arrest of hemorrhage. L. Earle endeavored to produce this irritation artificially by compressing the breast or making the nurse grasp the nipples and pull them; but this is idle play if the hemorrhage be profuse, and unnecessary if it be moderate.

2. If the *uterus be irregularly contracted*, perhaps a stricture present, and the patient complain of violent after-pains, then ergot, friction, and kneading of the uterus are contra-indicated. Antispasmodics should be given, such as Dover's powder, tinctura thebaïca, an emetic, and a mustard plaster to the sacrum. Good results may also be obtained from enemata containing 0.6 gm. tinctura thebaïca and an almond emulsion with extract of hyoscyamus (0.6 gm.). These are the cases—and they are not rare—which have brought many a practitioner to the conviction that there is no better styptic in metrorrhagia than opium, and especially tinctura thebaïca.

3. When the *uterus is firmly and well contracted*, and the external genitals and the vagina are not the source of the hemorrhage, the latter must come from the cervix, and internal remedies alone can be of no use. Styptics must be applied directly, viz., hot vaginal injections, the introduction of a

pledget of cotton saturated with solution of chloride of iron into the cervix, or tamponing of the vagina, best with salicylated cotton.

When the hemorrhage has moderated, a clean draw-sheet should be put under the patient and a fresh napkin under and covering the genitals so that it is possible to ascertain any moment how much blood is still escaping. When all internal and external measures are of no avail and vomiting is superadded, or when the anæmia is so great after the cessation of the hemorrhage that death seems imminent, transfusion was formerly thought to be indicated. But this soon came again into disrepute. In place of it may be recommended either auto-transfusion by firm bandaging of the extremities or the introduction of large quantities of salt water, partly per os, partly per rectum, partly hypodermically into the thighs, partly by injection into the veins (*Schwarz*, *Otto*).

During all more or less profuse and rapid losses of blood, the general condition of the patient must be watched at the same time. The position should be horizontal, the head low, the pelvis high, to guard against anæmia of the brain and stasis of the blood in the relaxed uterus, owing to the steep course of the internal spermatic veins. If the patient be very anxious and excited, large doses of tincture of opium alternating with the roborants often are surprisingly effective. Threatening syncope may be warded off with bouillon and wine internally, and eau de cologne or caustic liquor ammoniæ to the nostrils; nausea is combated with pellets of ice. A fresh, cool temperature of the room is secured by opening doors and windows, heavy coverings are removed, and all movements interdicted.

The *treatment of late puerperal hemorrhages* should aim first of all to remove their causes; unlike the metrorrhagias of the earlier days, they are rarely so profuse as to call at once for the application of styptics. The subinvolution of the uterus should be stimulated by the employment of ergotin internally and hypodermically, by hot vaginal injections and by regulating the stools. Remnants of the membranes and placenta, if discovered, are to be removed through the speculum with dressing forceps; decomposing fragments will be brought away by irrigating the uterus with 3 per cent. carbolic or boric acid solution and the fetid odor of the lochia thus done away with. The use of corrosive sublimate for irrigating the uterus is to be avoided, as poisoning is very liable to supervene.

If the hemorrhage was due to over-exertion, the patient should keep her bed for a longer time, take ergot, maintain the dorsal decubitus, and use hot injections. Displacement of the uterus, if present, should be corrected.

The *after-treatment* of patients who have suffered great losses of blood is very important. The first requirement is absolute rest in the horizontal dorsal position, avoiding movement as much as possible; the urine must be passed in the recumbent position, even speaking should be avoided, and fussy persons should be made to leave the room. If the patient is not so anæmic that all movement would be dangerous and milk is present in the mammæ, the child may be applied to the breast ten or twelve hours after the hemorrhage has ceased; but if the anæmia be considerable, we may wait one or two days until the patient has recuperated somewhat before allowing her to nurse. It is particularly in cases where the uterus is relaxed by hemorrhages that the contractions which are excited by the nursing child are of service. At first it will be necessary to supplement the breast milk with that of the cow, lest the mother be disturbed too often and too long by the infant. If the patient be very anæmic and debilitated, or if the secretion of milk be scanty, the child should not be applied to the mother's breast, for it will be injurious, increase the irritability and destroy the night's rest. The activity of the skin should be supported by keeping the patient moderately warm. The air should be fresh and the temperature of the room not over 66° F. In the first days, if the hemorrhage sprang from the placental site, the infusion of ergot mentioned above should still be used. The diet should be mainly liquid and not too hot—milk, bouillon, oatmeal gruel, yolk of egg, red wine, about a wineglassful every two hours, should be given in the first days. From the second or third day on the bowels should be moved by an enema of cold water. Early sitting up in bed should be strictly prohibited; after the fourth or fifth day the lateral position may be allowed. But these patients must remain in bed for a longer time than the average, and should not rise before the twelfth or fourteenth day, for after-hemorrhages, displacements of the uterus, syncope and sudden death have occurred where patients left their bed too early. If the feet become œdematous on rising, the legs should be bandaged with flannel rollers. In order to aid recovery, these patients should be given quinine with iron each 0.05 gm. three times a day in pills, or tinctura ferri pomati 0.6 gm. four times a day; bitter tonics are also applicable, as well as strong wine or good beer. Anæmic parturients should be guarded against great exertions for a long time and when menstruation first recurs they should remain abed lest they be weakened by a renewed great loss of blood. Any considerable hemorrhage should at once be arrested by appropriate medication.

(*b*) *Internal Hemorrhages.*

1. Effusion of Blood into the Tissue of the Vulva and Vagina. (Thrombus s. Hæmatoma Vulvæ et Vaginæ.)

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Anatomical Conditions.—Hemorrhages into the tissue of the external genitals affect most frequently the labia majora, more rarely the labia minora (labial hæmatomata), quite often they occur in the remains of the hymen, but may also be found on the perineum alone. In the perineum the blood pours in between the superficial and median fascia; in the vagina, into the submucous or paravaginal tissue. As a rule, the effusion is below the pelvic diaphragm, but cases have been reported by Cazeaux, Hugenberger, and the author in which the blood extended along the vagina as far as the peri-uterine cellular tissue, behind the peritoneum as far as the kidneys, in front of it to the umbilicus, and laterally as far as the ilia. In fact, in the more important cases of hæmatoma the effusion may spread in every direction, so that the entire vulva, the perineum and the vagina are greatly tumefied by the mass of blood, and the original source of the hemorrhage can no longer be determined. As the larger thrombi of the vulva always extend some way into the pelvic outlet, it is not possible in all cases to make a division into hæmatomata within and without the pelvis, such as Hugenberger has proposed; it is better to divide them into infra-fascial and supra-fascial, since this makes the pelvic fascia the limit, which is generally the case. Superficial hæmatomata may extend between the pelvic peritoneum and the pelvic fascia, and in the higher grades reach farther upward because the fascia opposes an obstacle to their downward extension into the external genitals. If the latter take place in spite of this fact, it will be due either to preceding irregular adhesions or subsequent sloughing and perforation of the fascia (*Hugenberger*). The tumors caused by the effusion of blood are from a hen's egg to a child's head in size, and usually owe their origin to a lesion of the vessels in the lowest part of the vagina, more rarely in the vulva. At times the hæmatomata project into the vulva in the form of pedunculated tumors of the anterior or posterior vaginal wall (*Fleischmann*). The effusion of blood is commonly venous. When these tumors break or are evacuated with the knife, large coagula usually pass, besides the dark fluid blood; they leave a cavity whose walls are completely saturated with blood and in which we sometimes find the opening of the vessel whence the hemorrhage sprang (*Rau*). These hæmatomata are usually unilateral, seldom bilateral. They are equally frequent on the right and left side. The points of rupture are generally the transition folds from the labia majora to the labia minora; here are formed smaller or larger roundish openings or even lacerations an inch long, at times a row of several. In a case reported by Dill of a primipara aged 20, where a spontaneous rupture occurred of a right hæmatoma the size of a child's head, ecchymoses in its neighborhood extended to the knee, the nates, the umbilicus, and on the right side even to the axilla.

Symptoms.—The formation of an effusion of blood into the tissue of the vulva and vagina is usually associated with intense pain, which is greater in proportion to the distention of the parts. It is often felt even before the tumor can be recognized externally, though the latter is rarely long delayed. With progressive increase of the pain, together with violent straining and pressing which the patient sometimes mistakes for strong after-pains, one-half of the vulva swells rapidly, the skin becomes bluish; if the tumefaction increases, vesicles form upon it; it becomes gangrenous, ruptures under the pressure, blood and coagula are evacuated, and this external hemorrhage may prove fatal in a few minutes (*Josenhans, Seulen*). But before this rapid evacuation takes place, alarming symptoms are generally present. The patients become restless, anxious; nausea, feelings of faintness, pallor of the lips and cheeks appear, and they complain without cessation of the violent pain. Symptoms of extreme anæmia soon follow, while no relaxation of the uterus is present and the external escape of blood is no greater than usual. When the hemorrhage ceases, either spontaneously or in response to the remedies employed, the tumor, according to its contents and extent, is found either tense, firm, not fluctuating when it incloses many coagula, or else exhibits distinct fluctuation when it contains much fluid blood. If the thrombus adheres laterally and rather firmly, and is of small bulk, the further symptoms may be slight; absorption not rarely takes place with moderate fever, the walls of the cavity adhere, and the tumor of the vulva disappears gradually. But if the hæmatoma is more extensive, pressure is exerted on neighboring organs above and below; compression of the urethra with ischuria, sacralgia and constipation ensue. The tumor may even narrow the introitus vaginæ so that barely a finger can be introduced, and the escape of the lochia is obstructed. Should the distended skin fail to break soon after the disappearance of the tumor, rupture and evacuation of the contents usually ensue within a few days. Even after evacuation, an after-hemorrhage and refilling of the cavity may take place (*Haase*, *D' Outrepont*, and *Dewees*). Should the rupture be complicated with gangrene of the vulva, septicæmia may develop and prove fatal (*Lubanski*, *Braun*). In some cases fistulæ of the suppurating cavity formed from the vagina to the perineum (*D' Outrepont*) or toward the rectum. These accidents were followed by protracted fever and profuse suppuration, with debility and slow recovery. The various terminations, therefore, are: death from hemorrhage with or without preceding rupture; death by sloughing of the sac with resulting septicæmia, most frequently after rupture or opening of the sac; rupture and recovery; rupture followed by fistulæ; absorption without rupture and complete recovery.

Diagnosis.—The diagnosis of these effusions of blood is generally easy. It is true, Deneux relates several cases in which they were mistaken for varicose tumors of the labia majora, for labial hernia or inversion of the vagina; and Dreyer describes a case in which he had reposited the tumor of the right labium, the size of a fist, by compression (?), although the swelling recurred; but these cases date from a period when these tumors were less known. Their sudden origin, their rapid growth, the bluish color of the integument, the pain, their elasticity, at times even their fluctuation, together with the rapid development of the symptoms of anæmia without hemorrhage into the uterus or externally, leave no room for doubt that we have to deal with an effusion of blood into the parenchyma. Its extent must be determined by digital exploration from the vagina and rectum. Only in those cases where the physician was present during the formation of the tumor can he decide with some degree of certainty whether the injured vessel be located in the vagina, the labia, or the perineum.

Etiology.—The lesion of the vessel which gives rise to the hæmatoma occurs, as a rule to which there are few exceptions, during labor, hence the tumor forms often during or soon after delivery. In several cases it has been observed between the delivery of the first and second twin. The time of occurrence depends mainly upon the nature of the injury. When a vessel is directly lacerated or ruptured, the effusion of blood begins at once; but it may be restricted through compression of the bleeding vessel by some part of the child and increase after the labor is terminated. If, however, pressure has produced a necrosis of the vessel wall during labor, the hæmatoma first shows itself after the separation of the necrotic tissue. The earl[illegible] a pressure from the inside of the vessel is exerted againstthe bruised sp[illegible] and the greater it is, so much the quicker will this yield. These pressur[illegible] necroses of the vessels are often associated with a corresponding necrosis [illegible] the vaginal wall and the blood would oftener escape externally, were it n[illegible] that these parts are displaced on each other with the termination of labor[illegible] It is self-evident that pronounced varices form a predisposing element t[illegible] these ruptures, for though the vessel wall is often thicker in varicose places, the tunica media is usually atrophic and the vessel therefore more brittle; but it is equally certain that many or rather most cases occur in patients who are free from such phlebectasiæ. Rupture and direct tearing of the vessels may take place during excessive exertion in the second stage of labor (violent straining, cumulative pains, precipitate labor), also during rapid dilatation of the genitals and direct injury by sharp objects (a blow, fall, etc.). If the hæmatoma occurs after labor in consequence of violent cough, we are forced to assume the previous existence of disease of the vessel or a contusion during labor, without which the cough would scarcely have effected a rupture of these distant veins. Contusion of the vessels ensues during the use of instruments when the child is large and the parts narrow, when the position of the head is unfavorable and the pressure on the soft parts continues long, or when the head is in a deep transverse position. Spontaneous origin is most frequent (86 per cent.). As regards the frequency of hæmatoma, Bossi found only two cases among 5660 parturients. Hugenberger, in the St. Petersburg Midwifery Institute, found among 14,000 labors 11 effusions of blood into the cellular tissue surrounding the genital apparatus. In Vienna 18 cases were met with among 33,241 labors. Besides numerous effusions of blood into the vulva ranging in size from a pigeon's egg to a walnut, I have met with six larger hæmatomata into the edges of perineal lacerations. Halliday Croom states that in cases of pendulous abdomen with strong anteversion of the uterus, the posterior vaginal wall is tensely stretched, while the head is still above the pelvic inlet, so that the thinned vessel walls are ruptured and the thrombus forms below the head, independent of the true trauma of labor, so-called.

Prognosis.—Deneux, who published a monograph on the subject in 1835, found a fatal result in 22 cases out of 60 (!); since then the view has become general that these tumors are very dangerous accidents. On the other hand, Girard, among 120 cases published in French literature, found only 24 fatal cases, some of which were complicated with other pathological conditions. In the uncomplicated cases the prognosis was not so very unfavorable. Fatal cases have been reported by Cazeaux, Lubanski, Broers, Seulen, Josenhans, and C. Braun. The causes of death were: hemorrhage after rupture of the tumor, in one case (*Cazeaux*) the blood extended to the umbilicus and the kidney; septicæmia (*Lubanski* and *Braun*), and typhoid (?) is given by Broers. In some of the cases of recovery the authors have subsequently witnessed normal labors (*Hecker*, *Nusser*, *Kretschmar*, the author) and have often looked in vain for the cicatrices of the former ruptures. Accordingly, the prognosis should be guarded, but is not as unfavorable as thirty years ago. I have lost none of my patients. When the evacuation is effected early without the occurrence of extensive gangrene of the soft parts or renewed hemorrhage, the prognosis is generally favorable; it is bad with extensive gangrene and profuse losses of blood; 12 per cent. succumb and the rest have tedious convalescence. The formation of fistulæ is, fortunately, rare (4 per cent.). At all events the prognosis in extensive subperitoneal hæmatomata of parturients is worse than in equally large effusions into the peritoneum (hæmatocele) of non-parturient cases. This surprising fact is explained in part by the numerous necrotic shreds of tissue forming in cases of puerperal hæmatomata which may cause putrid infection in part, by the great hyperæmia and the large vessels of the organs which favor the absorption of deleterious substances. Besides, it is certain that the lochia which flows past these tumors often contains bacteria which may penetrate not merely into an open, but perhaps even into the closed sac and cause sloughing. Finally, it must be remembered that even after rupture it is possible that the irregular cavity, containing numerous depressions and which is open to many septic agents, may harbor portions which cannot be completely disinfected with antiseptic injections.

The *prophylaxis* of hæmatomata belongs mainly to obstetrics. The application of the forceps in unfavorable head presentations and in the presence of great swelling of varices, as well as the use of chloroform, may at times be able to prevent their formation. But, generally, the occurrence of such blood tumors is a surprise to the attendant.

Treatment.—In order to guard against the extension of the thrombus, it is necessary to resort to styptics as soon as its occurrence has been recognized. If seated in the vagina, it should be carefully tamponed with cotton or a colpeurynter filled with ice water. Cold compresses or an ice bladder should be placed on the labial tumor; it is not advisable to compress it against the anterior pelvic wall. Internally, ice or opium should be given; the latter to quiet the excitement of the patient and to moderate the pain. When certain that the tumor has ceased to spread, we should restrict ourselves at first to the application of absorbents. I am far from sharing the view of Hugenberger that the tumor should be opened whenever it has ceased to extend. On the contrary, I believe that the size, the outward appearance and the surroundings of the tumor will determine our action; that no incision should be made when the hæmatoma is no larger than a fist, when the skin is not discolored or very tense, and rupture does not threaten at any point. These tumors may rapidly become smaller under ice compresses or lukewarm applications of lead lotion with opium (tinctura thebaica, [illegible] gm.; lead water, one pound), combined with absolute rest and the horizontal position. The lessening of the pain, tension and circumference will indicate that absorption has begun.

If the tumor does not shrink, if the skin becomes darker and pain greater, incision is called for. The time when this should be done depends upon the condition of the surface of the tumor; when it becomes livid, vesicles form and rupture threatens, the incision should be made at once, under al antiseptic precautions. After complete evacuation and irrigation of the cavity with carbolic acid, and the introduction of drainage tubes according to its size, it should be compressed with iodoform gauze, which is to be fastened by bandages applied around the large pelvis and between the thighs over the affected half of the vulva. If the effusion has extended high up, and, in order to guard against any after-hemorrhage, the vagina may be filled with carbolized tampons. The dressing is changed as often as it becomes saturated.

When the hæmatoma is large, absorption cannot be expected, hence the tumor should likewise be incised and the coagula removed. But unless rupture threatens and gangrene is commencing, it is best to wait until the third or fourth day, when the injured vessel will be firmly closed. If the tumor be incised immediately after its formation, after-hemorrhages may occur and be repeated in the following days; this is proved by the cases of Haase, Rau, D'Outrepont and Dewees; while after-hemorrhages have not been met with when the tumor ruptured or was incised later.

The incision is made at the most prominent point; if the labia majora are affected, the inner surface is the most suitable; it may be enlarged to two centimetres if the tumor be small, or to six or eight centimetres if it be large, so that all clots can be carefully removed.

The indications for the general treatment are the same as in all hemorrhages.

2. Internal Uterine Hemorrhage, Decidual and Placental Polypi and Hemorrhage into the Parenchyma of the Uterus. (Metrorrhagia Interna; Hæmatoma Uteri.)

LITERATURE.

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When after the expulsion of the ovum the internal os contracts normally, while the body of the uterus is imperfectly if at all contracted, the blood passing from the placental site cannot escape externally, but remains in the uterine cavity, where it coagulates. These clots, which adhere to the placental site, are usually flat and often include portions of the decidua, hence they have often been mistaken for remnants of the placenta, although they are often found in parturients whose placentæ appeared to be complete. They are of common occurrence in the bodies of dead parturients. These clots distend still more the poorly contracted uterus, thus increasing the hemorrhage, while the loss of blood further weakens the contractility of the organ. But if contraction of the uterus occurs spontaneously or in answer to external irritation, the coagula are entirely or partially expelled from the organ. Those that remain will finally be forced out by subsequent contractions.

In a few cases, however, these internal metrorrhagias give rise to the so-called fibrinous or placental polypus; the free polypoid hæmatoma uteri (*Virchow*). The point of their formation is usually the placental site, the blood escaping therefrom adhering to the uneven surface and forming larger clots by apposition of smaller thrombi. At times a placental remnant is enveloped by effusions of blood, which fasten them to the uterus. This connection gradually becomes firmer and may be drawn out to a pedicle, so that another formation, whose circumference in time assumes the shape of the uterine cavity through the pressure of the organ, acquires the appearance of a polypus. It generally consists of an external smooth, rather firm, pale layer inclosing concentric superimposed fibrinous strata. In the pedicle and base it is possible to demonstrate remnants of the fœtal or maternal placenta or fragments of the decidua. The size of these tumors may be considerable; thus Kuhn reported a case of a fibrinous polypus the size of a fist which was removed nineteen days after the delivery of a full-term child. The firmly adherent placenta had been detached artificially, but no part of it had remained in the uterus, nor could any remnant of it be demonstrated in the polypus. These formations can undergo no further transformation or organization; sooner or later they are expelled, the pedicle becoming detached or the clot falling to pieces, or being gradually forced out by more powerful contractions.

These free polypoid hæmatomata are to be distinguished from the parenchymatous uterine hæmatoma which consists of an effusion of blood into one of the walls of the uterus or the lip of the os. This likewise is very rare, may attain the size of a fist and disappear by rupture or absorption.

Symptoms.—In any considerable internal hemorrhage the above-described symptoms of anæmia often manifest themselves in a short time. The uterus becomes larger and larger, and owing to its slight resistance it is difficult to circumscribe it through the abdominal walls. If contractions occur now and then, they are usually very painful, and are associated with the escape of fluid blood and sometimes of a clot. If the fundus be grasped and compressed, very large clots are at times evacuated even after one or two days, whereupon the pain usually moderates. If the hemorrhage be less, the uterus is hard to the touch, firmly contracted and sensitive on pressure. The passage of blood continues longer, the uterus slowly diminishes in size and profuse hemorrhages repeatedly take place in the following days. The tendency to hemorrhages, again, keeps up the hæmatoma, because it dilates the parts more and more and drags apart the formerly bleeding spots. If remnants of the placenta or a placental polypus are present, the internal os and cervix open from time to time under increasing labor-like pains; the tumors descend lower and lower, and a new hemorrhage occurs. Then the contraction lessens, the orifice again closes, and this is repeated several times until the polypus is finally delivered with profuse hemorrhages or is removed by the physician. The involution of the uterus at the same time is usually retarded, the discharge after the hemorrhages remains offensive and is either quite purulent or brownish serous. Months may pass in this way and the patients become ever more anæmic; infection is also possible if the polypus slough.

Parenchymatous hæmatomata of the uterus may cause dysuria by pressure upon the bladder or jeopardize life by rupture and the formation of abscesses. Besides the case by C. Braun, I know of but a single one from the literature reported by Hohl; in this case, after rupture, rapid involution of the anterior lip ensued without any further difficulty. Earle mentions two similar cases by Montgomery and Johnston; the latter is said to have been fatal after the rupture.

The *diagnosis* of internal metrorrhagias is not difficult; the violent after-pains and the symptoms of anæmia force the physician to palpate the fundus uteri, when the size and relaxation of the organ, and the escape of blood under the pressure, indicate to him the nature of the hemorrhage. Free hæmatomata are more difficult of recognition; the retarded involution, the repeated hemorrhages, the opening and the renewed closure of the os which after full-term labors rarely remains patulous on the fourteenth day, and finally the appearance in the cervix of a tumor whose pedicle may be followed as far as the uterine wall, assure the diagnosis. That the tumor is fibrinous and not a true polypus is demonstrated by the fact that portions may be broken off from it, and by the examination of the removed masses which shows between the concentric layers of fibrin red and white blood-corpuscles, the latter at times in a state of fatty or colloid metamorphosis. In order to recognize parenchymatous hæmatomata, which may be confounded with great œdema of the lips of the cervix, the examination should be made through the speculum; the bluish coloration indicates the nature of the effusion present; moreover, œdema usually disappears rapidly after delivery, while hæmatoma remains for some time.

Etiology.—Internal hemorrhages of the uterus in the puerperium are caused by defective or absent contraction of the organ. In the former case, when the internal os alone is sufficiently contracted ; in the latter, when the escape of the blood is prevented by compression from without. Thus it is frequently found with ischuria in the first twelve hours after delivery; if the uterus still possesses some contractility, external and internal hemorrhage coexist. The retention of remnants of the placenta being usually associated with defective contraction of the placental site, while the rest of the uterus is well contracted, that condition is likewise a frequent cause of internal hemorrhages. In the bodies of parturients dying within the first two weeks we often find true remnants of the placenta from a walnut to a hen's egg in size, even when the after-birth was expelled by the natural forces. In 70 autopsies of puerperæ Stadfeldt discovered this condition seven times, in only two of which the placenta had been removed artificially. Polypoid hæmatomata are as likely to develop after abortions as after full-term labors, for their origin depends merely upon a hemorrhage and a dilated uterine cavity. As regards the place where polypoid hæmatomata are most liable to occur, it is notable that Stadfeldt met them relatively more frequently at the anterior uterine wall. This greater frequency of occurrence has been thought to be explained by the fact that the anterior surface of the uterus is more easily affected by traumatic influences with consequent inflammation. The supposition of Kiwisch, that they may occur also after menstruation without preceding labor, which has been disputed by Scanzoni, seems to be proved by a case published by Rokitansky, though the condition is very rare. Moreover, Rokitansky and C. Braun have firmly established the origin of these formations around parts of the ovum, especially remnants of the placenta. But that this kind of hæmatomata was known as such before the time of Kiwisch and Velpeau, though not by name, is proved by the following passage. Mursinna ("Krankheiten der Schwangeren, Gebärenden, Wöchnerinnen," etc., 2d ed., Berlin, 1792, Part II, p. 44) says: "As this part (the internal surface of the uterus) secretes much mucus, or at least a viscid glutinous fluid, this may, by degrees, so cover the blood clot that it becomes not only indestructible, but resembles a fleshy growth. Nay, more: such a clot of blood, owing to its adhesive quality, may really become attached to the inner wall of the uterus, grow fast to it, and subsequently degenerate more or less into a polypoid tumor. I believe, too, that the majority of growths after labor have originated in this way, but also that a still greater number are too early mistaken for them."

Prognosis.—Polypoid hæmatomata are nearly always associated with considerable hemorrhages and the sooner their cause is recognized the better. Aside from the faulty involution of the uterus, the anæmia and its consequences, these tumors offer a good prognosis: they are easily removed, the operation on the whole is painless and the recovery generally rapid.

Treatment.—Every internal hemorrhage, like the external, is to be treated according to its cause, and, generally speaking, in the way directed above. As soon as the presence of a foreign body in the uterus has been recognized, it should be removed manually, or, if this be impossible, the polypoid hæmatoma must be made accessible by the use of metallic dilators. It is to be drawn down with dressing forceps, detached from the uterine wall by twisting and the base scraped with the sharp spoon. But if the tumor be too high up and too firm, the fundus is to be steadied by an assistant, the polypus drawn down as far as possible, grasped with strong polypus forceps, the pedicle twisted off and the tumor extracted. The uterus must then be washed out with three-per-cent. carbolic acid solution. Ergot should be given for several days to stimulate the uterus to contract; the patient should be examined from time to time to ascertain whether the os is closing and the cervix undergoes involution.

In cases of parenchymatous hæmatomata of the lips of the os, the treatment is the same as in thrombi of the vagina or vulva: if absorption does not occur, an incision should be made through the speculum to evacuate the blood; should the hemorrhage continue after that, a portion of the wall may be resected, the cavity carefully cleaned, and the wound sutured and covered externally with an iodoform tampon.

CHAPTER IV.

Puerperal Inflammations of the Genitals.

1. Inflammations and Ulcers of the External Genitals and the Vagina.

Puerperal ulcers of the vulva and vagina are generally situated at the posterior part of the introitus vaginæ, whence they extend both laterally and upward into the vagina; their shape is very variable in these locations. They are also found on the inner surface of the nymphæ in the shape of narrow, long, purulent surfaces reaching to the clitoris or the orifice of the urethra. At times they completely surround the introitus vaginæ. In the vagina they are most frequent in the lowest portion and at the fornix, and rarer in the median portion, at the anterior or posterior wall. As a rule these ulcers show themselves within two or four days, sometimes even within the first twelve hours after labor, when the lesions of the mucosa lose their healthy appearance, become yellowish-gray, their margins red and painful, and the wound surface begins to secrete. They extend into the surrounding parts and œdema of the vulva is frequently superadded. The latter complication corresponds to the seat of the ulcers, *i.e.*, it is either at the posterior commissure or at one or both of the nymphæ or involves the entire vulva.

The other portions of the vulva and vagina in cases of ulceration are usually swollen, reddened, and secrete more abundantly. The appearance of the ulcers is quite changeable; at first they are covered with a thin layer of pus, sometimes the surface soon becomes gray, when the surrounding parts are generally more firmly infiltrated, œdematous, swollen and much reddened. While the secretion of the simple ulcers consists mainly of pus-corpuscles usually mixed with blood cells, the adherent crust contains numerous pus-corpuscles, granular detritus and various cocci, which will be referred to later on. The introduction of the crust of puerperal ulcers into the trachea of rabbits, experimentally done by Birch-Hirschfeld (comp. "Lehrb. der pathol. Anatomie," II, No. 37) always produced negative results, while, according to Oertel, diphtheritic pneumonia occurs in these animals after the introduction of true diphtheritic masses. At the onset of the change the formerly fresh wound looks lardaceous, faintly yellowish, and soon it may be seen that the sharp edges have become uneven, as though gnawed into, and rough in places. At times it is possible to recognize at a distance of a few millimetres from the wound, roundish, pale, gray spots covered with smooth epithelium (bacterial crust) which soon coalesce with the original ulcer. Some parts of the margins of the ulcers now and then become discolored blackish brown, gangrenescent, while the appearance of the remaining suppurating surface grows worse and its secretion offensive. Of much rarer occurrence are the forms of phlegmonous inflammation without injury of those parts, in which are subsequently developed abscesses with large losses of substance. When an ulcer forms in the higher portions of the vagina and the pus burrows, it may point in the perineum and be associated with swelling of the external genitals which may resemble a phlegmon, but never runs the pernicious course of a true puerperal phlegmon. Abscesses develop very rarely in the labium majus.

The first symptoms of commencing ulceration in parturients are slight pains and some burning sensations in the genitals, especially during micturition. Swelling of the vulva is superadded in at least two-thirds of the cases. Thereby the escape of the urine is interfered with, and the suppurating points are inevitably moistened with it. The lochia becomes offensive. If the ulcers are situated near the urethra or its orifice, retention of urine is often present. More or less high fever is usually observable, but a chill at its onset is rare; the type is remittent and the exacerbations occur in the evening. The highest temperature is generally reached on the evening of the third day. The ordinary duration of the ulcers is two or three weeks; they cicatrize slowly and continue longer when the patients leave their beds too early; they cause pain on walking and sitting, and hemorrhages are occasionally caused by friction. The œdema of the adjoining parts generally disappears long before the complete closure of the wound. Narrowing of the vulva and vagina by these cicatrices, on the whole, is rare, and is observed, as a rule, only after extensive losses of substance following gangrenous ulcers.

In order to recognize clearly the condition of the above-described ulcers, ocular inspection is absolutely necessary; frequent examination through the speculum is required and should never be neglected when œdema of the vulva is present without any cause of it being apparent at the introitus. The same holds true in the case of ischuria. In order to decide the nature of the ulcer a microscopic examination should also be made. It is easy to distinguish puerperal ulcers from syphilitic affections by their extent, form, rapid formation, and brief course.

Etiology.—A predisposition to the development of ulcers in the puerperium is formed by gonorrhœic inflammations of the cervix, vagina and vulva during pregnancy. For these reasons it is clear that such ulcers and œdemas are very frequent in maternities and much rarer in patients of the better classes. Since lacerations of the mucous membrane occur in nearly every delivery, while puerperal ulcers are rather rare, especially in private practice, it is evident that the normal lochia, as a rule, is not likely to give rise to the transformation of a laceration of the mucosa into an ulcer. But if the lochia contain decomposing particles (remnants of the membranes or placenta) or purulent masses from the cervix, the uterus or the vaginal vault, these anomalous admixtures may infect previously normal raw surfaces. But as a general thing the ulcers of the vulva and introitus vaginæ in the puerperium appear first, so that the infection of the organism is to be traced to them, nor is there the least doubt in my mind that the lesions of the introitus vaginæ furnish the most important points of entry for the poison. The first suspicion that infection will occur, that poison lurks in an institution, I always deduce from the development of such puerperal ulcers in several patients in succession, and in that event take immediate measures to prevent the further spread of the poison. Moreover, puerperal ulcers may develop from ruptured thrombi of the vulva and vagina; in that case they are usually large sanious patches in which portions of necrotic tissue may be recognized.

Prognosis.—Most of the lacerations of the mucosa of the introitus vaginæ cicatrize without ulceration: after very slight secretion, there are formed in a few days granulations which finally change into fibrous connective tissue. The majority of the vulvar and vaginal ulcers in parturients likewise close without any ill effect. At most the recovery of the patients is somewhat slower on account of the fever. The prognosis is less favorable when the raw surfaces show the above-described coating, because the fever is usually higher, the recovery slower, and secondary affections of the pelvic cellular tissue and the blood may ensue. The occurrence of ischuria is likewise unpleasant, since it may delay the closure of the ulcers, owing to the dragging, distention and irritation by the catheter which must be used. For this reason ulcers situated at the anterior vaginal wall and close to the urethra and its orifice are less favorable than those located at the posterior commissure.

Treatment.—The external genitals and the vagina in maternities must be frequently rinsed with carbolic acid (3 per cent.) or creolin solution (½–2 per cent.), partly for the purpose of removing the infectious excretions and thus preventing the occurrence of puerperal ulcers, partly to act directly on the ulcerating surfaces already present.

But if there is a firmly adherent coating on the ulcers, my experience indicates that the most thorough measure for its destruction is an energetic cauterization, once daily, with pure liquor ferri sesquichloridi. Of course, this is quite painful in most cases, but the cauterization need be done but once a day, and repeated only three or four times, as a rule.

For the œdematous swelling of the vulva lukewarm applications of lead water are employed.

If retention of urine is present, the catheter must be introduced at least twice daily, of course with due precautions. Defecation should be facilitated by enemata.

The fever, as a rule, requires no internal treatment; if obstinate constipation coexists, high enemata or castor-oil may be given.

Nursing women who are suffering from ulcers should not apply their children to the breast until their hands have been most carefully cleansed.

2. *Simple Inflammation of the Vagina and Endometrium.* (*Colpitis et Endometritis Puerperalis Simplex.*)

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Anatomical Conditions.—In the simple but more frequent forms of so-called catarrhal colpitis and puerperal endometritis we find the mucosa of the vagina very hyperæmic and swollen, the papillæ prominent, the secretion more abundant than usual; the lips of the os are tumid, swollen, with numerous, often œdematous, readily bleeding granulations, and covered with small glandular cysts no larger than a lentil; the cervix presents a similar appearance. As this form is very rarely fatal, such affections can be examined only through the speculum, and quite exceptionally at the post-mortem. At times, however, they are found also in the cadaver, distinct and isolated, and we then recognize that the disease extends to the entire cervix, frequently in part to the inner surface, and especially to the placental site. The mucosa sometimes shows small, closely aggregated roundish swellings the size of a pin's head, which, when opened, discharge a purulent fluid. The underlying tissue is normal, only rarely a slight œdema of the muscular structure can be recognized; the uterus is generally well contracted. The endometrium is usually covered with a mucous or muco-purulent brownish fluid. In the slighter as well as in the graver cases the cervix, particularly the external os, and the placental site are most affected by the disease.

Symptoms.—The symptoms by which we are able to diagnosticate endometritis with great probability, even when no larger puerperal ulcers exist in the vagina, are offensive lochia and fever. The fetor, which indicates abnormally rapid decomposition of the lochia, is often so penetrating that it is soon observable throughout the room, and particularly when the patient is uncovered. The lochia, moreover, remains sanguinolent for a longer time than in normal cases. The fever is distinctly remittent, almost intermittent, the acme being here, too, generally on the evening of the third or fourth day, but may be found much later, especially when due to decomposition of remnants of the ovum. In that case it is connected with the absorption of putrid materials into the blood; the characteristic point is the frequent occurrence of later attacks of fever. Not always, but in many cases, at the beginning or in the course of the endometritis, there is a brief chill followed by fever. Prolonged, intense rigors, however, as a rule, indicate metastatic pyæmia. The local disease usually outlasts the fever for some time, though diminished in degree; and a sudden exacerbation is frequently associated with the above-mentioned later attacks of fever. A very common and significant symptom, especially in primiparæ, is unusually painful and prolonged after-pains in the first days of the puerperium, provided no abnormal uterine contents can be demonstrated as their cause. Partly owing to the hyperæmia of the innermost layer of the uterus which is present in endometritis, partly owing to the infiltration of the muscular tissue which sometimes exists, a defective involution of the affected portions results—that is to say, mainly of the cervix and the placental site; thus after-hemorrhages and displacements may be indirect consequences of the disease. Besides, the catarrh not rarely becomes chronic. This explains how, despite the apparently rapid cure or relief of the original disease, many patients remain ailing for months or years after.

This fact is especially noteworthy, because, as a rule, few, if any, subjective symptoms are associated with these changes. Besides the abnormally protracted after-pains, the patients suffer from headache, loss of appetite, furred tongue, irregular defecation, and perhaps a sensation of heat low down in the abdomen. But such symptoms being frequent in connection with the first swelling of the breasts, the patients comfort themselves with the idea that this is the so-called milk fever, especially if a chill coexist, and their friends coincide in this view. But a careful examination of the external and internal genitals, and particularly the use of the thermometer several times a day, will most clearly indicate to the physician that the fever is not one of a single day, and the offensive odor of the lochia should always call attention to a disease of the vagina or uterus. The condition of the abdomen, which is usually soft, and, like the body of the uterus, hardly sensitive to strong pressure, as well as the subsequent examination with the speculum, assure the diagnosis.

The causes of the disease are pretty well known. In the first place, many women carry this affection from pregnancy into the puerperium. This is true particularly of unmarried gravidæ. But in many cases the disease arises first during labor, especially when the membranes have ruptured prematurely; furthermore, it is caused by uncovering the patient, and mainly by the numerous lesions of the mucosa in connection with the penetration of foreign bodies (vernix, meconium, lanugo) and the circulatory disturbances in the walls of the cervix. In the puerperium, decomposing, putrid remnants of the ovum and placenta may cause erosions, hyperæmias and swellings of the parts with which they come into contact. Such an endometritis may also occur in connection with a lesion of the vaginal vault or the os uteri after it has been transformed into an ulcer. It may be concluded from the variety of these causes that endometritis must be very frequent in the puerperium. And indeed it is one of the most common affections of the parturient and most important as forming a predisposing factor to puerperal mycoses, although it is not so frequent that it may be taken to be the starting point of all puerperal uterine diseases, as Martin and Buhl assume. Its isolated occurrence, apart from all complications, is very rare. This rarity of uncomplicated puerperal endometritis has also been confirmed by Schroeder.

Prognosis.—Under appropriate treatment an acute puerperal colpitis and endometritis lasts, as a rule, one or two weeks, and the fever about three to seven days; but usually it becomes chronic, and the more or less frequent exacerbations keep the patient in bed for a longer time. The disease generally is by no means serious, but it increases the danger of infection and therefore indicates particular care in the exercise of all precautions. An extension of the disease over the entire endometrium and thence even to the tubes and the peritoneum is, however, rare. But it is our duty to attack the disease vigorously because it is usually followed by fever lasting several days and sometimes of great severity, by defective involution of the uterus and often by other troublesome annoyances.

Treatment.—By injections of 3-per-cent. carbolic acid solution into the vagina the morbid secretion must be regularly removed and the hyperæmia and swelling moderated at the same time. Should the offensive odor remain pronounced, a 3-per-cent. carbolic solution or a ½–2 per cent. creolin solution may be injected into the uterus several times daily through a Rein's catheter. When the abdomen is tense or the uterus alone somewhat tender on deep pressure, compresses of lukewarm water may be applied externally. Under this treatment the hard, board-like uterus soon becomes softer, the after-pains recur at rarer intervals and are less painful, and the temperature falls. If the after-pains still remain excessive, hot vaginal injections are to be recommended. The bowels should be kept loose by castor oil or, when this fails to operate, by small doses of calomel, 0.1–0.3 gm. As soon as the patient gets up, the lips of the os and the cervix must be examined through the speculum, and the drugs (tannin, alum, nitrate of silver, iodol, iodoform or liquor hydrargyri nitr. oxydulati) applied regularly once a day to the diseased points. The injections are also continued; if the colpitis is very pronounced, iodoform bougies or iodol glycerin tampons should be used.

3. Inflammation of the Uterus, of the Subperitoneal and Pelvic Cellular Tissue. Pelvic Exudations. (Metritis, Parametritis, Phlegmone Pelvis.)

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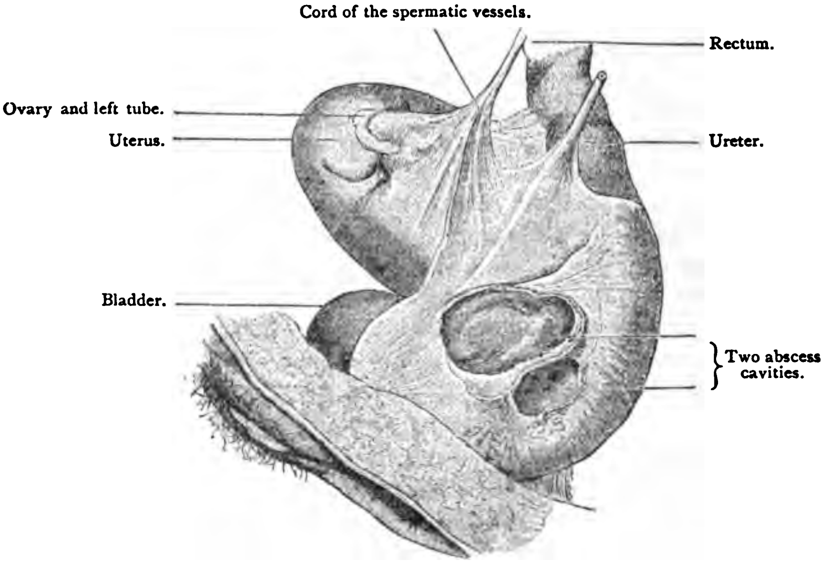
The cellulitis starting from the uterus may remain local and confined to the pelvis or extend to all the organs of the abdomen and thorax. In the former event, parametritic pelvic exudations develop, while the inner surface of the uterus often is but slightly affected; in the latter case, a more or less extensive ulcerous inflammation of the vagina or uterus is generally present. Virchow was the first to teach the profession to determine the disease, pointed out its importance, and gave the process this name. In connection with lesions or ulcers of the cervix the intermuscular connective tissue of the uterus begins to swell, owing to a transudation into it of an albuminous fluid. In like manner the connective tissue at the base of the broad ligaments, around the uterus and the vaginal vault exhibits soon after the beginning of the disease a cloudy swelling in streaks and spots and, as a rule, appears somewhat gelatinous. Under the microscope the connective-tissue corpuscles are seen to be enlarged, their contents at times distinctly granular, the cell body opaque throughout; by enlargement of the nuclei, followed by division of the cells, smaller roundish, biscuit-shaped rows of granulation cells are formed. But a large number of these roundish granulation cells are emigrated white blood-corpuscles. With these, however, Waldeyer, and after him Birch-Hirschfeld, has demonstrated large masses of bacteria in the infiltration of the pelvic connective tissue in a state of phlegmonous inflammation, and these, without exception, were the pyogenic streptococcus, as we have repeatedly proved in our clinic. The entire subserosa of the uterus and that of the broad ligaments is swollen, the above-mentioned multinuclear elements form continuous streaks (deposits of pus); the two layers of the broad ligaments may be easily separated, and the serosa can be readily stripped from the uterus. This process creeps along the connective-tissue trabeculæ and extends in the first place to the pelvic cellular tissue. Thus there are formed tumors from a hen's egg to a man's head in size, which at first adhere by a broad base to the lateral wall of the uterus from which they are not easily differentiated when their thickness is slight. But soon they grow in every direction and reach the pelvic wall, extend in front and behind the uterus, lift up the peritoneum above, overtop the psoas and iliac muscles, and protrude below alongside the vagina beneath the level of the os. In this variety of simple and very frequent pelvic phlegmons the lymph-vessels, as a rule, participate only to a slight degree. Even the larger tumors of this kind may be completely absorbed. If this does not occur and an abscess forms (Fig. 177), this will force its way either through the rectum or through the bladder, the uterus, the vagina, through the external abdominal walls above Poupart's ligament, even through the sciatic foramen beneath the glutei. The pus is evacuated and the rest of the tumor disappears gradually. The peritoneum is often dragged away from the ileo-psoas muscle so that a puncture may be made several centimetres above Poupart's ligament without injuring it. On the pelvic tumors, which usually are rather hard, we can sometimes notice the development of small, soft, almost fluctuating places which contain pus. In rare cases opportunity offers to study such large parametritic tumors in the cadaver (Fig. 177). This occurrence oı pelvic abscess in parturients has long been known and the above-mentioned tumors have been accurately described by other observers, such as Bell, Schweizer (see above), Chomel, Rayer, Velpeau, Grisolle, Battersby, Schmidt, Lever, Aran, Deutsch and Guéneau, but they were in error in their conception as to the point of origin of this affection; they believed that the pelvic cellular tissue was first affected, or else the peritoneal covering of the uterus, and therefore called it pelvic cellulitis, pelvic or perimetritic abscess. As late as 1857 Deutsch maintained that those abscesses were not the immediate result of inflammatory affections of the organs contained in the pelvis,

FIG. 177.



Parametritis acuta puerperalis abscendens. Peritoneal exudation in Douglas' pouch.

but in many cases the local metastasis of a general blood dyscrasia. According to more recent investigations, however, there can be no doubt that the affection starts from the inner surface of the uterus. The abscesses occurring in the pelvis may be divided into intraperitoneal or perimetritic, and subperitoneal or mainly parametritic; a further division of the latter into sub-aponeurotic and supra-fascial is much more difficult.

Symptoms.—The disease, as a rule, begins in the first week after labor, with chills, and frequently also with a rigor, abdominal pain and fever. The pain is felt on one or the other side of the uterus, and is particularly marked on pressure; at first it is circumscribed, and is due to an implication of the peritoneum; it is generally slight; the abdomen appears somewhat tense, but otherwise not sensitive at many points; the spontaneous pain at times moderates, but the high temperature remains, and on careful examination it is often possible in two or three days to demonstrate a swelling alongside the uterus at the point where the pain is most violent. At first the swelling is small, often difficult of demarcation from the surroundings; sometimes it represents a narrow or roundish cord, but usually grows pretty rapidly. As soon as the tumor has reached the lateral pelvic wall it becomes immovable, and by its increase crowds the uterus to the opposite side. It spreads in front and behind around the latter, and often forms toward the vagina uneven tubercular prominences. By extending along the ilium, even to the neighborhood of the kidney (paranephritis), it exerts pressure on some branches of the crural nerve, also on the external cutaneous nerve, and sometimes on the obturator. Accordingly, pains ensue around the kidney, in the lumbar region and along the thighs, which may last for several days and be very violent. Furthermore, distubances of motility appear, especially of the adductors; sometimes, when the sciatic plexus is compressed, also in the other muscles of the thigh, so that the patients, if they are out of bed, can only painfully limp around, dragging the leg, the body being bent forward; or else they are unable to put the feet on the ground, but rise and move solely by the aid of the hands. Comparatively seldom we find considerable dysuria in the shape of vesical tenesmus, pain in micturition or complete ischuria. Owing to the displacement of the uterus and the impeded circulation within it, its involution is retarded, and the lochia, which at first was sparse and at times offensive, often again becomes sanguinolent. Not rarely we find that, while the original exudation begins to diminish, the tumor extends in another direction with increase of the fever. Thus it may wander from the left to the right side, be completely absorbed on the left and perforate on the right.

The fever in parametritis is at first considerable and of a subcontinuous type. The highest temperature occurs within the first five days. On the seventh or eighth day a noticeable remission generally occurs toward morning. The highest temperature which I have noted in this period was 106°

F. in the vagina; on the average it rarely rises above 105° in the evening. The remissions occur in the morning. After the first marked fall a remittent fever remains, and this is not infrequently followed by a complete intermittent fever with evening exacerbations, which gradually declines into the normal temperature. In the cases under my care the patients were rarely free from fever before the end of the third week. Repeatedly I have even observed cases in which the tumors persisted for more than three months without forming abscesses, and in which irregular paroxysms of fever recurred frequently, almost every ten to fourteen days. The pulse in the morning varies between 72 and 104, in the evening between 80 and 116; the number of respirations ranges between 14 and 32. Exacerbations of the affection are frequent. They usually set in with a chill, and are associated with greater pain in the affected side and with swelling of the tumor. The rise of temperature at the same time is considerable, and sometimes lasts only one to three days, but usually from seven to eight days. If a hectic fever develops with repeated chills, and the exacerbations are violent, the exudation will change into an abscess, which will point in one of the above-mentioned places. After the evacuation of the pus the patients often improve rapidly, pain and fever decline if the pus escapes readily; any obstruction to the flow causes renewed pain and higher fever, which, however, soon disappear with another evacuation. If the exudation perforates into the rectum, it is possible, as Guéneau reported, that extensive ulcers may form in the rectum and colon and be associated with exhausting diarrhœas. As a rule, fæces or urine do not enter the abscess cavity, owing to the oblique direction of the perforation, the action of the abdominal pressure on those points, and the ordinary dry state of the fæces (*König*).

As to the termination of the affection, absorption of the exudations is most frequent (80 per cent.). The duration depends on the size of the tumors and averages 52 days.

Abscess formation and perforation of the pus occurs in 18 per cent. Gravitation beneath Poupart's ligament is most frequent. The pus may follow either the course of the vessels or that of the muscles or that of the external cutaneous nerve; next in frequency is perforation into the rectum, then into the bladder and vagina; while it is equally rare into the uterus, the perineum, the abdominal cavity or alongside the quadratus lumborum muscle. Very rare is the gravitation of the pus toward the greater sciatic notch; I have observed it in two cases, one of which was fatal. Sloughing of the exudation is as rare as death from perforating peritonitis or from exhaustion by the fever (1 to 2 per cent.).

Diagnosis.—In private practice, parametritic exudations not rarely fail to be recognized, since they are not associated with any very prominent symptoms except pain and fever, and because the essential vaginal exploration and the taking of the temperature are often neglected in the first days of the puerperium. It can hardly be sufficiently insisted upon that when fever occurs in a parturient patient, its height must be accurately determined and a careful examination made of the genitals. The discovery of a tumor alongside the uterus then is not difficult. In a large number of cases of this kind no primary peritonitic symptoms precede the onset; hence it is hardly possible for any doubt to arise whether a tumor observed by the side of the uterus is intra- or extra-peritoneal. But at times these tumors form with symptoms of peritonitis and then the diagnosis is more difficult; the rapid spread of the exudation beyond the limits of the peritoneum, along the vagina below the level of the os, or its early descent beneath Poupart's ligament indicate their extra-peritoneal location. Moreover, these pelvic exudations as a rule are hard at first and soften only gradually in some places; while intraperitoneal exudations are softer and larger in the beginning and become harder and smaller by absorption. Frequently parametritic and peritonitic exudations coexist. Hence we often find, after the peritonitis has run its course, the development of a right or left parametritis, especially when the ice bladder has been removed too early. Confounding parametritic exudations with tumors of the ovaries, which has repeatedly occurred, can only be guarded against by a careful observation of the entire course; for the acute development of a cyst in the puerperium may likewise produce peritonitic symptoms. Softer consistence, greater mobility, and uniformly continuous growth always point to an ovarian tumor; hard, firm consistence, immobility, occasional sudden diminutions and the generally complete disappearance of the tumor settle the diagnosis of a parametritic exudation. The exudations may also be mistaken for retroflexion of the uterus; but careful external and internal examination will disclose the fundus uteri in the normal position in the former condition, while the irregular shape of the body will show that it cannot be the uterus. Confounding the affection with retro-uterine hæmatocele will be guarded against by a full history of the symptoms manifested at the beginning of the tumor, and the examination of the general health, especially with a view to discover anæmic symptoms. With hydatid cysts between the vagina and rectum the exudations can hardly be confounded, owing to their irregular shape and firm consistence.

Etiology.—Inflammation of the cellular tissue may occur in and beside the uterus as well as at other places without our being able in all cases to demonstrate directly the point or the injured place which has absorbed the poison. But as a rule such tumors develop after preceding injury or contusion or after ulcers of the os or cervix or of the higher portions of the inner surface.

The exudation seems to occur with equal frequency on either side.

Lever had called attention to the fact that in "pelvic cellulitis" the process attacked mainly that part which had been exposed to pressure, chiefly by the occiput, in slow labors or those terminated artificially. The frequent coincidence of perineal lacerations and the formation of exudations is important; hence primiparæ seem to be particularly predisposed. Very rarely a pelvic phlegmon arises secondarily from caries of the pelvic bones (coxitis and carious destruction of the acetabulum), from periphlebitis and abscess formation, also from injuries to and contusions of the vagina against the pelvic wall.

The *prognosis* of uncomplicated parametritis, as a rule, may be considered good; for these affections rarely endanger life. But the duration of the disease is protracted and if an abscess form the patients have to endure much pain until the pus is evacuated, and besides are greatly debilitated by the prolonged and high fever. Still, abscesses form in but one-seventh of the cases, and after the evacuation of the exudation the patients generally recover rapidly. Although the patients may be informed that the tumor does not endanger life, and that perforation may be avoided by careful carrying out of the directions, it should be added at the same time that they must be prepared for a long treatment and a slow convalescence of at least five to six weeks.

Parametritis and pelvic exudations in general are as liable to occur sporadically, isolated, and in private practice as in maternities. At the present day few pathologists will doubt that they are due without exception to infections the nature of which we will discuss hereafter. Reliable landmarks as to the prognosis with reference to the termination of the tumor are furnished us by the thermometer; an early fall and continuous low temperature, as a rule, indicate beginning absorption; frequently recurring evening exacerbations, threatening abscess; and renewed exacerbations after evacuation of the pus, relapses or gravitation toward other points. König states that limping gait, sterility, disturbed menstruation and pain during coition may remain, but such sequels are fortunately rare.

Treatment.—As soon as the affection is recognized it is necessary to remove all factors which may increase congestion of the pelvic organs or hinder the reflux of the blood; hence we advise recumbent position, interdict all unnecessary movements, and regulate defecation by enemata. When the lochia becomes offensive, or ulcers are present at the vulva, vagina or os uteri, they must be treated at once (see above). When the abdomen is painful, an ice bladder should be applied. When the pains have disappeared and the ice bladder can be dispensed with, mercurial ointment should be rubbed in, 1 gm. every two hours until salivation commences, or instead of this potassium iodide ointment; water compresses may be continued at the same time. Warm poultices are indicated only when suppuration with external perforation are to be encouraged. In the majority of cases we must endeavor to favor absorption in every way, since the greater number recover fully by complete absorption. But if the fever, pain and tension of the tumor indicate suppuration, the pus should be removed as early as possible.

Exploratory puncture may precede the incision at the most prominent point, usually immediately above Poupart's ligament near the anterior superior spine. If the tumor bulges most markedly toward the vagina or rectum, it may be opened there by means of a curved trocar and evacuated. In tumors which begin to burrow through the great sciatic notch out of the small pelvis, fluctuation should be looked for behind the great trochanter, but it is not easily recognized. Here, too, the location of the pus should be first determined by a long exploratory trocar, then a long bistoury inserted by the side of the canula, a drainage tube introduced, the cavity disinfected, and if arterial hemorrhage follow, strong pressure applied by means of tampons; in this way the patient can often be rapidly cured. Warm and lukewarm full baths are very grateful to the patients as long as fever is present.

Internally, when the fever reaches 103°, we may give antifebrine or antipyrine in doses of 0.25–0.5 gm., besides cognac, claret and port wine in appropriate doses.

The after-treatment requires at first sitz-baths, vaginal suppositories of potassium iodide, internally, quinine and iron, with strengthening diet; active movements out of bed should not be allowed until late and with due precautions. For the removal of the last remnants of the exudation, Thure-Brandt's massage or Weir-Playfair's method of forced feeding may be employed, and the patient finally restored to complete health by mud and brine baths.

4. Disease of the Uterus Associated with that of the Lymphatics and the Peritoneum. (Metrolymphangitis et Peritonitis.) The so-called Septic Form of Puerperal Fever.

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Pathological Anatomy.—In about four-fifths of all grave attacks of puerperal fever, the internal surface of the uterus is diseased, besides the presence of ulcerous processes in the vulva and vagina. The fissures at the lips of the os are discolored grayish-yellow, the margins reddened and the surrounding tissue swollen. The inner surface of the cervix and body of the uterus appears covered with yellowish-gray purulent fluid, very hyperæmic; at the placental site and in the cervix are isolated smaller or larger ulcerations, analogous to those in the vagina; they are round or slit-like, more or less deep, and covered with a firmly adhering exudation. At times they completely surround the internal os, occasionally they extend as narrow streaks from the placental site to the cervix.

The subperitoneal connective tissue shows cloudy swelling, is gelatinous, and the process extends from there partly to the sheaths of the vessels, partly to the peritoneum. The lymphatic vessels are almost constantly affected; they appear varicose or dilated like a rosary; their wall is thickened, their contents are friable and either firm or softened, usually yellowish and pus-like. This condition generally prevails on both sides of the uterus, but often only on one side, corresponding to the largest ulcers on the inner surface or the placental site. Around the larger vessels diffuse extravasations of blood are sometimes found (*Buhl*).

In the highest grades it is possible to recognize purulent patches not only in some portions of the uterine muscle, but it is sloughing throughout, the thrombi are destroyed, the openings of the veins patulous, the necrosis extends as far as the peritoneum, which at this point shows a yellowish crust and is finally perforated (*Klob, Scharlau*). Such conditions in the highest grades of endometritis have been described by Boër under the name of "putrescentia uteri." The bladder likewise takes part in this process, crusts being found here and there on its mucosa, and its muscular structure is infiltrated and thickened. The retro-peritoneal lymphatic glands at the same time are swollen, pale, œdematous and in rare cases contain pus.

Other frequent complications are swelling, abscesses, or acute œdema of the ovaries, which latter condition is at times followed by so great a softening that the organs tear on gentle touch and change into a dirty, slimy mass (*Virchow*). The exudations are always most extensive and thickest in the small pelvis, where they often completely surround the ovaries, tubes and uterus, cover the posterior wall of the bladder and fill Douglas' pouch. The abdominal ends of the tubes are frequently thickened and dilated, the fimbriæ reddened and swollen, the mucosa injected and the lumen filled with a viscid or purulent secretion; while the uterine portions appear unchanged. The parietal and visceral peritoneum is opaque and injected throughout; the mesentery, too, often presents thick and dense injections or a whitish-gray cloudiness. The coils of the intestines are adherent at many points, and here and there some deposits of pus are found between them. The liquid exudation is generally also very abundant, and consists of a light-green and yellowish whey-like serum mixed with pyofibrinous flakes; it may perforate the abdominal wall at the umbilicus (*Langlet*), or at other points (*Illoway*). Owing to the paralysis of the muscular coat, the intestine is tympanitic, the entire intestinal wall considerably thickened and adherent, its mucosa much swelled, the follicles enlarged, here and there denuded of epithelium, and small ulcers are frequent in the jejunum and ileum. Liver, spleen and kidneys are hyperæmic, even softened and enlarged, the first two containing deposits; the capsule of the liver and kidneys is often distended and not easily stripped from the friable organs.

The diaphragm is crowded high up by the intestinal distention, the heart displaced to the left; the lower lobes of the lungs therefore appear compressed, even to complete atelectasis, while the upper lobes are more or less œdematous. If the peritonitis is complicated with pleuritis, the disease of the pleura is absolutely like that of the peritoneum, there being considerable liquid exudation, mixed with fibrinous coagula and deposits on both layers of the pleura. From the pleuræ the poison extends to the pericardium, *i. e.*, pericarditis forms. The heart muscle is flabby, limp, softened, and the primitive bundles are degenerated. From the organs in the thorax the disease extends to the thyroid and the axillary glands. Within the cranium there is often œdema of the brain, and increase of serum in the ventricles; meningitis is very rare. The articulations are at times affected with pyarthrosis, especially the shoulder and knee joints; but the smaller joints occasionally become diseased, mainly those of the thumb and some of the phalanges. Lastly, muscular abscesses occur at the same time at the upper extremities and in the glutei, which may be very extensive.

In partial puerperal peritonitis the oldest and most extensive exudations appear at the points whence the disease has migrated to the peritoneum (tubes, ovaries, uterus, etc.).

Aside from disease of the uterine wall, a puerperal peritonitis may also arise from extension of the inflammatory process to the tubes and thence to the peritoneum. In peritonitis due to salpingitis, the disease can often be demonstrated in both tubes, more rarely in one only. In the first stage the mucosa is greatly injected and swollen, the secretion increased, the tube being filled with a viscid fluid. But, as a rule, the catarrh soon changes into suppuration, the epithelium is cast off, the secretion appears purulent, more or less thick, or serous and brownish-red. Then follow perisalpingitis, perioöphoritis and pelvic peritonitis. Ulcers appear at some points of the inner surface of the tubes. Agglutination of the abdominal ostium leads to pyosalpinx or the pus from the tube may be evacuated in different directions. It is most liable to be poured into the peritoneal cavity. A proof that in such cases the peritonitis is really the consequence of the salpingitis is furnished by the fact that the process is most intense around one abdominal ostium of a tube, where the alterations and exudations are the oldest. Buhl and Klob, as opposed to Förster, believe the evacuation from the abdominal ostium to be the usual occurrence, while the latter author assumes perforation of the tubes, but in the cases described by Erichsen and myself, no lesions were found in the tubes. The pus may also be evacuated between the broad ligaments or into the uterus, or, after adhesion of the tube, into the bladder or rectum; especially the latter is said to have been repeatedly observed (*Andral*). The tubes may be distended to the size of a child's head before they rupture. Sometimes it is difficult to isolate the tubal sac from the masses of exudation. Usually the accumulation of pus and distention of the tube affect the abdominal half, and to a much slighter degree the portion adjoining the uterus.

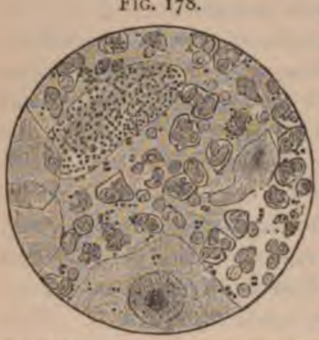
If pus accumulates in the inflamed ovaries, peritonitis develops with adhesions between the ovaries and neighboring structures, as the bladder, uterus, rectum, intestines and omentum, at times to isolated encapsulated peritoneal exudations around the diseased ovary. The suppuration may gradually perforate the wall of the ovary and the contents be evacuated into the abdominal cavity or into such other cavities as may have become adherent. Sometimes subperitoneal abscesses are present at the same time over the ilia, at the psoas muscles, in the inguinal canal, the labia and in the small pelvis.

Symptoms.—The course of this disease is, as a rule, very acute. In the first stage of the disease we find almost constantly an intense prolonged rigor (lasting from one-half to three hours) which is sometimes preceded by abdominal pain. During the rigor the abdomen grows more tense, and soon after, the increase of peritoneal serum can be demonstrated by palpation and percussion. The pain then becomes much more intense and is very violent during respiration, when the patient turns, and on palpation. At first the patients react most intensely to the examination of the uterus, which is hard to the feel. At times the pains are so great that not even the pressure of the coverings can be borne. Considerable rise of temperature and increased frequency of the pulse and respiration are associated conditions. Cerebral congestion is indicated by violent headache, flushing of the face, tinnitus aurium, scintillation before the eyes, vertigo, often by epistaxis. With repeated chills or a rigor the exudation in the abdomen increases materially in the second stage, often after a few hours; the tympanitic resonance becomes dull in the lateral regions adjoining the uterus and above the spines of the ilia. The pains become more intense; besides great thirst, the patients suffer from nausea, and vomiting occurs, at first of the remnants of food and mucous masses, later of bile-stained or brown, coffee-ground-like fluids. The abdomen becomes as tense as a drum, partly owing to the inflammation of the intestinal mucosa, partly because the tone of the circular muscles decreases during the high fever, whereby the absorption of the formed gases is diminished, and partly because the development of gas is abnormally great in the presence of the fever and the diminished absorption. The diaphragm and the anterior abdominal wall are bulged upward and forward because they have to some extent lost their elasticity by the distention in the preceding pregnancy. The dyspnœa is increased by the meteorism and becomes particularly great when pleuritis or catarrh of the respiratory passages is superadded.

The lochia (Fig. 178) usually becomes scantier and is more or less offensive according to the implication of the endometrium in the disease; it contains numerous streptococci, monococci, diplococci, decidua cells, red and white blood-corpuscles. More rarely considerable uterine hemorrhage occurs. The urine is diminished in quantity and becomes poor in chlorides. Retention of urine is often the result of infiltration of the bladder muscle. The serous imbibition, the collateral œdema of the muscular and mucous coat of the bladder occasionally cause albuminuria without vesical catarrh; but the latter condition is also frequently present as a consequence of the continued inflammatory irritation or of the necessary catheterization. Similar alterations in the intestinal wall explain the constipation which is an early symptom. Later this is replaced by diarrhœa when the intestinal mucosa becomes diseased and ulcers form upon it, or when the intense meteorism and the development of gas in the intestine overcome the resistance of the sphincter.

The secretion of milk, should it have begun, usually is soon arrested; the breasts remain limp and lax. The disturbances of respiration caused by the meteorism are characteristic: it is particularly in the most serious forms of diffuse phlegmons that we find the innumerable superficial hurried respirations of a purely costal type in which the auxiliary muscles are soon called into action for inspiration. Considerable cyanosis of the fingers, face and neck is present, in consequence of the defective oxygenation of the blood. The sensorium, as a rule, is clouded early in the infectious cases of rapid course: the patients soon appear somnolent, slide down in the bed, have slight delirium and answer only when sharply spoken to. In general, they complain little, euphoria appears rather early, but sometimes they are excited and may be maniacal. Occasionally, however, the pain due to the peritonitis or pleuritis prevents the occurrence of stupor, and in that event the patients may remain fully conscious to the last moment.

FIG. 178.



Putrid lochia. Temperature from the fourth day on, 100.4-102.2° F. Free nuclei, many white and few red blood-corpuscles, some packed with germs; the decidua cells contain streptococci, monococci and diplococci.

Pleuritis, which is frequent, usually unilateral, more rarely bilateral, begins, as a rule, suddenly with acute stitches in the chest. If dyspnœa was not present before, it now occurs in an intense degree; the violent pains evoke loud lamentations from the patients, and frequent attempts to alleviate the suffering by changes of position.

Pericarditis is much rarer, and as it occurs generally a short time before death, is usually unassociated with marked symptoms. The inflammations of some joints manifest themselves by redness, swelling and local pain, which is occasionally so severe that touching the inflamed parts will rouse the patient from stupor. Sometimes fluctuation can be felt if the process last several days, and even perforation and ankylosis may occur (*Olshausen*), but most of the patients die before the pus breaks through.

The type of the fever in metrolymphangitis, as a rule, is subcontinuous, the ascent is generally very rapid, often in a few hours amounting to 3.5–5.5°; the temperature varies between 102° and 107.5° F., the exacerbations being most frequent in the evenings. Occasionally, during and after considerable exudations, great remissions to 100.5° F. ensue. The pulse varies between 96 and 132 beats, about 120 being most common. The quality of the pulse is changeable. At first it is often full and hard, after the exudation soft, easily compressed; later, again, slower and more vigorous.

If the peritonitis remain circumscribed, the powers of the patient be not too much weakened, and the exudation be not too large, there is frequently, after the second stage has lasted six or eight days, a considerable fall of temperature, with profuse sweats, or rapidly increased diuresis with moderation of all symptoms; the pains especially diminish, the intolerable tension of the abdomen and the dyspnœa begin to decline, the patients fall asleep, the vomiting and the chills cease to return, and while the exudation gradually lessens the patients make a more rapid recovery than would have appeared credible after the first threatening symptoms.

While in the above-described acute peritonitis the rigor often occurs even during delivery, or a few hours later, and the exudation generally begins at the same time, the development is still more rapid in peritonitis acutissima, such as ensues with salpingitis, after perforation of some abdominal organ, and after serious injuries. With or immediately after some bodily exertion, for instance, during micturition, defecation, sitting up, very violent pains suddenly set in. The rigor, distention of the abdomen with great, at first unilateral pains and exudation are here almost coincident, and in a few hours the exudation may envelop all the organs of the abdominal cavity; sometimes exudation is preceded by painful diarrhœal stools. Pulse and temperature rise with equal rapidity; but while the pulse and respiration attain an excessive height (172, 40–60 respectively), the temperature gradually undergoes a constant fall. Violent, frequent and very distressing vomiting, involuntary defecation and micturition set in; sometimes the sensorium is clouded early, sometimes it remains clear until death.

The inflammation of the peritoneum which occurs in a more chronic form in the puerperium is usually partial, a pelvic peritonitis. With the initial chill the abdomen begins to become painful in its lower half, and in the pelvis an exudation forms which causes, by pressure on neighboring structures, pains in the lower extremities, retention of urine, constipation, and swelling of the hemorrhoids. The abdomen is tense only below the umbilicus, and the abdominal coverings are usually more yielding, so that the distended intestinal loops form visible and movable protrusions near and above the uterus. The fever and the frequency of the pulse and respiration in these cases are not nearly as great as in acute peritonitis; the affection generally begins more slowly and later, and may last for weeks or months, strong remissions being frequent at first in the morning. Relapses and sudden exacerbations, however, occur at times. The group of symptoms is very similar when puerperal oöphoritis gives rise to peritonitis.

The *terminations* in the above-described acute course may be:—

1. Complete recovery. It is common in vigorous persons under correct treatment when the peritonitis is moderate in degree. Somewhat retarded involution of the uterus, late hemorrhages and uterine displacements remain as sequels of the peritonitis.

2. Death occurs in the acute cases generally between the fifth and ninth days, often later in consequence of relapses in the shape of pleuritis or a renewed large peritoneal exudation, by exhaustion. In these cases we sometimes find considerable rise of temperature before, and occasionally even after death (in one of our cases to 108.3° F.).

3. If the peritoneal exudation does not soon disappear by absorption, but, on the contrary, the encapsulated deposits increase, certain sequels develop. The masses, having undergone fatty degeneration, decompose, the peritoneum and the underlying structures (intestine, uterus, bladder) are perforated, and the exudations are evacuated externally. Subsequently, fæcal masses may enter the cavity of the exudation and set up sloughing. In this way are caused additional perforations of the sac of the exudation in other directions, and diffuse, rapidly fatal peritonitis; or else, after perforation into other cavities, intestino-vesical, intestino-vaginal, and utero-intestinal fistulæ. Sloughing exudations occasionally give rise to peritonitis and necrosis of the pelvic bones; it is also stated that they have caused erosions of the parenchymatous abdominal contents, the liver and spleen, with profuse hemorrhages (*Klob*). When the exudation is very large, it is possible that it may perforate the abdominal wall (cases by *George Moore*, *Ed. Martin* and *J. de Laplagne*).

Peritonitis acutissima, as a rule, soon terminates fatally. Recovery is very rare. Death occurs usually in from 16 to 48 hours after the onset.

In puerperal salpingitis death generally occurred on the seventh or eighth day of the puerperium. Cases of this nature, in which the peritoneal exudation is not very large and is encapsulated, but subsequently absorbed or evacuated through the bladder, rectum or uterus, seem to be very rare.

Chronic peritonitis, on the other hand, terminates favorably, as a rule, and is rarely fatal. But it acts injuriously, by retarding the involution of the uterus and by the residuary pseudo-membranes, which fix the uterus, or distort and displace it by their contraction. Metrorrhagias, menorrhagias, dysmenorrhœa, versions and flexions of the uterus, are its usual sequels.

Diagnosis.—Violent pains about the uterus, the rigor, the distention of the abdomen, its great sensitiveness to pressure, the fever and the vomiting, readily characterize the affection of the peritoneum; but its starting-point must be looked for, and a careful examination of the external and internal genitals should never be neglected. Through the speculum we see the grayish-yellow, ulcerous appearance of the wounds in the vulva, vagina, and at the os. The demonstration of the exudation by percussion, and, especially when it is abundant and not encapsulated, by changing the position of the patient, when the dullness disappears from the upper side of the patient, is simple enough. At times it is possible to feel the exudation externally if it project from the lesser pelvis; more frequently, it is palpable from the vagina or the rectum. When the liquid exudation decreases, the pains moderate and the dullness disappears, encapsulated masses of exudation remain between the intestines and can, not rarely, be diagnosticated by percussion or palpation. Here the thermometer is the most important diagnostic auxiliary. When great rises of temperature still occur in the evening, we can be pretty sure that deposits of pus are present, and that the inflammatory process continues. The intestinal and vesical discharges, then, should always be carefully examined, with a view to recognize whether purulent masses are evacuated with them. By laxatives and enemata we shall guard against mistaking fecal accumulations for peritoneal exudations. From subperitoneal abscesses peritoneal exudations are differentiated mainly by their location and their surface. The location of the abscesses is usually at some point extending over the course of the peritoneum, deeper or more lateral in the pelvis or toward the thighs, and the surface is more uneven, rough, and frequently can be more distinctly circumscribed than peritoneal exudations. But of the greatest importance for the differentiation will be the development of the abscesses, which, generally, is effected without any considerable implication of the peritoneum, and especially without extensive peritonitis. Where both kinds of exudation are coincident, the diagnosis is at times very difficult, but becomes less so in the further course. Those within the peritoneum are usually larger, and on pressure emit crackling, rubbing sounds, because coils of intestine are adherent to them, which is not the case in those lying outside. Subperitoneal and peritoneal extravasations of blood can usually also be distinguished by symptoms of anæmia from inflammatory peritoneal exudations.

The diagnosis of a peritonitis due to the escape of pus from the tube is possible by way of exclusion only when a rapid exudation forms in the peritoneal cavity without any demonstrable other cause, especially perforation of the intestine. The enlarged tubes are to be felt only with great difficulty per vaginam, because the tension of the abdomen is usually too great; per vaginam and rectum combined, it may be easier.

In the case of ovarian abscesses it is possible to mark out their outlines and consistence, and the diagnosis of the disease is difficult only when a considerable peritoneal exudation is present at the same time. By bimanual examination from the vagina and the abdominal wall and from the rectum we shall recognize the tumor, by the distinctly circumscribed, generally smooth, though somewhat uneven surface, and by its tenderness, as an ovarian abscess, especially when the uterus can be isolated alongside of it and moved independently.

The *prognosis* depends upon the intensity of the process. While absolutely unfavorable in peritonitis acutissima, it is fairly good in the chronic form, the only danger attaching to the numerous serious consequences. In the acute form it is graver in proportion to the rapidity of its onset, the size of the exudation, and the weakness of the patient. Peritonitis which occurs alone, without associated deep disease of the uterus, is more favorable than one complicated with parenchymatous metritis. Traumatic peritonitis, under timely treatment, furnishes a pretty good prognosis. Considerable remissions in the temperature and pulse, especially at the end of the first week, always permit a favorable prognosis; renewed great exacerbations are more serious; the same may be said of additional chills; they are usually followed by parametritis. Death occurs most frequently between the fifth and the ninth day, rarely after the lapse of weeks.

Etiology.—As regards the cause of the disease of the endometrium the reader is referred to the general etiology, also with reference to the associated metrolymphangitis and secondary peritonitis. Primary puerperal peritonitis develops frequently after infected wounds of the peritoneum, such as occur in deep lacerations of the cervix, contusions of the uterine wall against the pelvic bones (contracted pelvis), and ruptures and lesions of the uterus. Lesions of other pelvic organs, the bladder, the ovaries, or contusions of uterine tumors (myomata), are often associated with peritonitis; also contusions and incarcerations of the intestines occurring during labor. That prolonged retention of fæces in the intestines may be able to give rise to all the symptoms of peritonitis was known already to Baudelocque, illustrated by Lamazurier with an excellent example, and lately again emphasized by Poppel.

Infectious catarrhs of the tubes which have existed before pregnancy are the more liable to predispose to puerperal salpingitis, because immediately after labor a hyperæmia of the tubes, broad ligaments and ovaries occurs which may materially enhance the blennorrhœa. Most authors (*Vocke, Förster, Buhl* and *Martin*) assume that salpingitis in the puerperium is usually of secondary origin, starting from an endometritis; but unquestionably the salpingitis may follow a peritonitis (*Erichsen*, *Fischer*) and in rare cases may even occur quite isolated and primarily. In those cases in which endometritis, salpingitis and peritonitis are present, the peritonitis may spring from the first without the intervention of the second; in that event the salpingitis would be only an immaterial complication.

The peritonitis develops more rarely in connection with abscesses which have formed in the wall of the uterus. Furthermore, the perforation of extra-peritoneal exudations, the rupture of ovarian cysts, effusions of blood into the peritoneal cavity (hæmatocele, rupture of the uterus, rupture of the tubes, etc.), a periphlebitis with abscess formation, suppuration of a lymph cavity in the fundus uteri (case by *Spiegelberg*), and, finally, perforation of the intestines, with the escape of fecal matter, may be followed by peritonitis.

Treatment.—There are no specific remedies against puerperal peritonitis; the causes of the disease can only rarely be completely removed. In the way of prophylaxis, whenever the abdomen of a puerpera becomes distended and painful after labor, we must make tepid local applications of from 71–77° F. and secure free defecation by enemata or castor oil. Where there is an offensive uterine discharge containing numerous cocci, we must give not only vaginal, but intra-uterine antiseptic irrigations, one, two or three times daily, by means of Rein's catheter (see Fig. 171). Permanent irrigation of the endometrium I have given up altogether; although I have used it in some cases with good results (see "Pathologie des Wochenbettes," 3d ed., 1878, pp. 49 and 50), it was precisely with this method that I subsequently experienced the gravest cases of infection (comp. *Centralbl. f. Gyn.*, 1878, No. 7). The drugs which may be used for irrigation are 3–5 per cent. solutions of boric or carbolic acid, 1 : 1000 solutions of salicylic acid and 0.5–1 per cent. solutions of creolin. Use has also been made of sulphite of sodium in 10-per-cent. solution with 5 per cent. of glycerin, and in recent times especially of sublimate solution, 1 : 5000–1 : 2000. Although many authors obtained most favorable results with the latter (*Dumas*, *Conte*, *Bonnet*), a number of fatal cases of poisoning occurred in rapid succession (*Stadfeldt*, *Elsässer*, *Tänzer*, *Köhler*), which make its employment, even in very weak solutions, appear rather questionable. The writer has never yet used it for intra-uterine injections because the reaction toward mercury is very variable and many persons possess a decided, abnormally slight power of resistance in reference to it.

Several authors urgently recommend the introduction of iodoform suppositories into the diseased uterine cavity (*Alloway*, *Ehrendorfer*); a trial of it would certainly be advisable. Each suppository is composed of 5–6 gm. of iodoform, with gum acacia, glycerin and pure starch āā 0.6 gm. The suppositories are made about 5–6 cm. long, and are inserted into the uterine cavity by means of dressing-forceps, after exposing the cervix and washing out the uterus with 1–2½ per cent. carbolic acid solution. When the discharge is very sanious, two suppositories may be introduced at once and the application be repeated after three or four days. Ulcers present at the cervix must be cauterized every other day with liquor ferri sesquichloridi. Local abstraction of blood by leeches is not to be recommended. When the quantity of serum increases while the pain is still moderate, painting the surface of the abdomen with tincture of iodine is useful; if the pain and meteorism do not soon decline, one to four ice bladders are at once laid upon the abdomen on a thin linen cloth. These are to remain well filled day and night until the patient is free from fever for several days and complains of their presence. Then, often not until after weeks, we may do without them; but whenever the temperature rises again or the pains recur they must be reapplied.

When the abdominal distention remains great in spite of the measures recommended, we may employ enemata with 15-30 gm. of oil of turpentine. Puncture of the intestine when the meteorism is great—which Levrat employed with success, and which Scanzoni also did several times with an exploratory trocar, with immediate relief to the patient—I have tried once, without the least benefit to the patient. When ischuria is present the catheter must be used three times a day.

The proper arrangement of the bed is a matter of course; owing to the meteorism, the head should not lie too low; the buttocks must be so supported by an air cushion or soft pillows that the patient will not glide down in the bed. As it is not easy to move the patient, and the bed is liable to be fouled with urine and fæces and the external genitals soiled, the latter and the region of the anus should be washed several times a day with vinegar, so as to prevent bedsores as long as possible.

Moreover, in order to support the organism in every way in its fight against the microbes, the maintenance of nutrition is of the greatest importance, and to be effected by strict regulation of the main functions of the body; in the second place, by stimulating the circulation and respiration, the exchange of gases in the tissues is aided and the excretion of the products of metabolism increased. The latter object is effected mainly by baths, which I have recommended as early as 1866, in the shape of lukewarm full baths, and again in the third edition of my "Pathologie des Wochenbettes," pp. 39 and 40, owing to their beneficent effect on more than one thousand parturients. I have had no experience with the hot full baths recommended by Fitzgerald for peritonitis.

Following Breisky, Gusserow and others, and with a view to guard against heart failure, to diminish the decomposition of albumin, and to exert a favorable influence on the sensorium, circulation and respiration, M. Runge in particular has employed alcohol in large doses to the amount of 150 gm. of cognac and half a bottle of red wine per diem. Runge has had good results with this treatment. The first case in which I used this alcohol treatment in equally large doses unfortunately terminated fatally. But the method at all events is rational and deserves further trial.

Internally may be given: antifebrine 0.25–0.5 gm., or antipyrine 0.5 gm., one to three times a day. When the fever has moderated and the exudation is diminishing, diuretics, and perhaps cathartics, are to be exhibited: calcined magnesia, castor oil, and small doses of calomel when the constipation is greater. As a refreshing drink we may order dilute solutions of sulphuric or hydrochloric acid, with fruit juices; they diminish the lactic acid fermentation in the intestine, and hence the meteorism (*Traube*). If violent vomiting prevails, the painful straining will be moderated by pellets of ice or ice cream or small doses of opium, by hypodermic injections of morphine into the pit of the stomach, by the occasional ingestion of seltzer and soda water or champagne in small quantities; if they fail, it will be advisable to keep the stomach empty.

The diet, while the fever is high, should be restricted to soups. As soon as convalescence has begun, nutritious food, at first in liquid form, should be given; more solid food must be avoided for some time.

If there remain an encapsulated peritoneal exudation within or above the lesser pelvis, the treatment described on page 794 is to be employed.

Laparotomy has been repeatedly done in puerperal peritonitis; but the result was always unfavorable in the so-called septic diffuse form; in the circumscribed benign forms, especially in perforating peritonitis soon after the perforation, now and then with good effect (*Sonnenburg*); these cases were combined with drainage of the abdominal cavity.

For the pleuritic pains we may order sinapisms or friction with chloroform liniment. When the joints become painful they may be wrapped in cotton or painted with collodion.

I cannot sanction the treatment formerly much in vogue in England, started on the European continent by the Prague school, and especially recommended by Breslau, of Zurich, namely, the treatment by active purgatives, such as infusion of senna, large doses of calomel, castor oil, croton oil and jalap; I am rather inclined to assent fully to the objections raised by Hecker, Holst, Ed. Martin, Gusserow, Scanzoni and others. In the lighter cases this may at times have a good effect, but in those which are grave from the start it can only act injuriously by rapidly increasing the collapse. Drastic purgatives appear to me so much less in place, because, as a rule, swelling and even partial ulceration of the intestinal mucosa is already present. Besides, even if the poison were entirely or largely removed from the body by the watery evacuations, the numerous organic diseases caused by it could hardly be removed with them. But at all events the results of this treatment would have to be far more favorable than they are in Prague, Zurich and Berlin before one could really recommend it.

The mercurial treatment advocated especially by Fischer (according to the experience gained in Traube's clinic), which Velpeau formerly had long employed, and which consists in the exhibition of 0.05 gm. of calomel every two hours, and the inunction of 1.0 gm. of unguentum hydrargyri into different parts of the body at the same intervals, I have not rarely resorted to. The occurrence of salivation in connection with it is said to be usually associated with a change for the better, according to Hugenberger, Fischer, Veit and others, although it is well known that salivation sets in at different times, not only in various individuals, but also according to the mode of introduction of the mercury; subsequently, the mercurials are to be intermitted and laxatives given. Even during the treatment enemata and castor oil must be given regularly, because, if constipation be present, diphtheritic conditions of the intestinal canal may be caused by the decomposition of the calomel. Veit is convinced that the mercurial treatment is the one which presents relatively the best results, although it arrests the progress of the peritonitis only in the minority of cases. I cannot say that I have had particularly favorable results; the quantity of mercury used externally varied within very wide limits.

APPENDIX.

In like manner as in wounds of the genital canal, infection may also result from lesions of the rectum; but it is exceedingly rare. The only case which has come under my observation I report below, because it is readily distinguished from those described above, both symptomatically and by the occurrence of infection, most probably, several days after labor.

A IIpara, aged 34, after a first stage of 12½ hours and a second stage of 10 minutes, was delivered of a living girl (46 cm., 2750 gm.) without anything abnormal being demonstrable during labor except slow, premature escape of the waters. The urine was free from albumin. The temperature immediately after labor was 100.4° F. No hemorrhage occurred. In the first six days the patient was quite well; she received an enema on the third day, and complained on the same day of some cough and coryza and sensitive breasts. But all these troubles had completely disappeared on the fifth and sixth days. The pulse and temperature observed till then ranged between 48 and 70, and 99.5° and 100.75° F.

Toward noon of the seventh day an intense rigor, lasting twenty minutes, suddenly occurred, and the patient commenced to complain of pain in the rectum; she was unable to pass water, the abdomen was sensitive on pressure, and was somewhat tense. Whether the patient had received an enema on the preceding day was not exactly ascertained. But as her evacuations had not been profuse, she was ordered a tablespoonful of castor oil; this was followed by a free stool, partly firm. The intestine, the posterior commissure and the posterior vaginal wall appeared somewhat swollen, and the latter slightly distended. The next day, despite the application of the ice-bladder, the abdomen was still more painful, tongue dry; many thin stools passed, partly involuntarily. The uterus was slightly displaced in its lower part, crowded toward the anterior pelvic wall, the rectum swollen, painful on pressure; thin-fluid serum in the abdomen. The countenance was notably pale; great muscular weakness. Splenic dullness 9.5 : 12.5. The patient suffered pain on pressure upon the left ilio-cæcal region. Only the systolic sound of the heart could be heard, the diastolic sound was barely marked. Pulse dicrotic. The respiration, 26–28, with partly open mouth, resembled that of a sleeping person. The fæces were partly passed in bed. Under these circumstances, especially as the fever had set in at the end of the first week, although it had quickly reached a height of 104° F., and in the second week remained at 102–104°, with slight remissions; and furthermore, as the ilio-cæcal region was sensitive to pressure, the tongue dry, diarrhœa and splenic tumor were present, typhoid fever suggested itself, though we had observed no roseola. Toward the end of the second week the temperature slightly declined.

10th day:	7 A.M.	10 A.M.	12 M.	1 P.M.	2 P.M.	4 P.M.	6 P.M.
	103.5°	103.5°	101.5°	100.1°	99.2°	102.5°	102.2° F.

The pulse, however, remained between 88 and 118, and was small; the thin stools continued. Great restlessness, muscular tremors, and violent headache set in, and the patient died on the 12th day of the puerperium. The autopsy on the succeeding day showed the following:—

Lepto-meninges delicate and transparent, in the space between the arachnoid and pia pretty abundant serum. Brain cortex grayish-red, medullary substance lustrous white with rather numerous rose-red spots; much serum exudes from the cut surface; corpus striatum and optic thalamus, as well as the other cerebral ganglia, the medulla, pons and cerebellum, moderately filled with blood.

The mucosa of the pharynx and epiglottis bluish-red, somewhat thickened, free from deposits or ulcers. Moderate injection in the larynx, trachea and the larger bronchi. Contents frothy mucus. In both pleural cavities a turbid fluid to the amount of about 60 gm. On the visceral pleura of the lower lobes of the lungs and on the diaphragmatic pleura fine fibrinous deposits. Small sub-pleural ecchymoses. The lower lobes of the lungs less voluminous, bluish-red, deficient in air. Moderate œdema throughout. The smallest bronchioles, especially of the lower lobes, hyperæmic in their mucosa. Pulmonary vessels contain fluid blood; bronchial glands small. The pericardium contains the usual quantity of clear serous fluid. The layers of the pericardium free and smooth. The heart somewhat broadened, very lax. Left ventricle contains fluid blood and pale fibrinous coagula. Its flesh is pale red in color, striped, friable (in a state of fatty degeneration, as shown by the microscope), especially toward the origin of the vessels. Endocardium thin. Right ventricle dilated.

Abdominal region much distended; in the abdominal cavity about 500 gm. of free yellowish-white fluid. The serous membranes of the abdominal organs, especially of the intestines, adherent together and covered with yellowish-gray masses of fibrin, the vessels greatly injected.

Liver moderately large (1906 gm.). On the capsule of its anterior surface extensive grayish-yellow fibrinous membranes; liver tissue friable, yellowish-brown, acini indistinct (considerable fatty infiltration and degeneration.)

Spleen considerably enlarged (207 gm.; 15, 8, 3 cm.), its capsule somewhat wrinkled and thickened. Splenic tissue soft, pale brownish-red, stroma and Malpighian corpuscles indistinct.

Both kidneys rather deficient in blood in the cortical portion, the pyramids pale red. Moderate fatty degeneration in the cortex; pelvis normal.

Bladder contracted, contains some turbid urine; mucosa slightly reddened. Stomach moderately dilated, mucosa pale red, fresh ecchymoses in the fundus and along the lesser curvature, folds moderate.

Small intestines, especially the lower coils of the ileum, considerably distended. The wall (especially mucosa and muscularis), rigid, with œdematous infiltration; the glands of the mesentery and the follicles not infiltrated. Colon in general likewise distended, especially the sigmoid flexure and cæcum, mucosa pale; fæces thin, yellowish-green.

Uterus somewhat larger than a fist, moderate deposit of fibrin upon its peritoneum. The uterine wall is pale on section. The vessels are contracted, partly closed by firm coagula of fibrin. (Spermatic and uterine veins contain fluid blood.) Lymph sinuses narrow, without abnormal contents. The internal surface of the uterus in general is free from extraneous deposit. Placental site to the left above, of normal appearance. Only around the external os the wall is somewhat friable and contains small extravasations of blood.

The tubes are not dilated. Ovaries of normal size, moderately firm on section. The right contains a corpus luteum the size of a bean.

Vaginal mucosa pale red, devoid of ulcers.

On the inner surface of the labia majora are several excoriations with clean bases.

Around the sphincter ani, both without and within, is a circle of varices; 5 cm. above the internal sphincter is a roundish ulcer the size of a quarter dollar, whose situation corresponds to the anterior wall. The bottom of this ulcer is covered with a yellowish-green crust with fecal admixture. The ulcer extends down into the submucous cellular tissue. Starting from the ulcer there is a purulent infiltration of the entire rectal wall which, decreasing in thickness above, can be followed as far as the sigmoid flexure; moreover, the cellular tissue around the rectum, and from that point the cellular tissue of the entire pelvis is infiltrated with a yellowish gelatinous mass. This infiltration may be followed upward in the retro-peritoneal cellular tissue to the height of the kidneys and continues also into the cellular tissue between the broad ligaments to their summit. The corresponding surfaces of the peritoneum are marked by more pronounced vascular injection and thicker deposit of fibrin.

The retro-peritoneal glands are recently infiltrated, and to a less degree the inguinal glands.

There is nothing abnormal to be noted of other parts.

The microscope showed numerous round bacteria, both in the free peritoneal fluid and in the pelvic cellular tissue; in the blood slight increase and some granulation of the colorless corpuscles.

The autopsy, therefore, proved without doubt that it was not typhoid fever, but a paraproctitis with peritonitis and pleuritis, starting from a rectal ulcer, which was the cause of all the symptoms. The general appearance of the patient had led us to consider the local, correctly determined disease of the rectum and pelvic cellular tissue as of secondary importance, or, rather, as a concomitant symptom of the assumed disease of the small intestine. This observation is particularly interesting, because the infection, as is evident from the facts cited, did not occur until the later days of the puerperium (sixth to seventh day), and at a point where it is exceedingly rare. The location of the ulcer, 5 cm. above the internal sphincter, was too high to lead us to assume that it had been caused by the canula introduced for the enemata; no ulcers had been present in the corresponding part of the vagina or on the perineum; hence, we are forced to the conclusion that the infecting bacteria were, perhaps by a finger, introduced during Ritgen's manipulation, deposited on the rectal mucosa, and there set up the infection. Unfortunately, this possibility could not be ascertained from the history.

An ulcer may also be caused on the vesical mucosa by an infected catheter and be followed by general infection of the patient, with fatal result. This mode of infection I have observed in one case and confirmed by autopsy.

5. *Puerperal Venous Thrombosis and Metastatic Pyæmia; the Venous Form of Puerperal Fever.*

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Venous thrombosis of the uterus starts either from the placental site or from some other portion of the uterine wall. In placental or traumatic thrombosis, the coagula which occur physiologically at the placental site continue thence into the substance of the uterus and may intersect it in all directions, as Erichsen found in one case. The second form of thrombosis occurs first as a thrombosis of dilatation. It may set in at any point of the uterine wall which has remained insufficiently contracted for any length of time. In this as in the other variety, because the rapidity of the current is diminished at those places, there are formed, as was first observed by Hayem and Bizzozero, from the firm, somewhat adhesive disks—the blood plates—granular masses, the thrombi, which are traversed by trabeculæ of fibrinous material. Besides these two, there may occur a thrombosis of compression by the formation of eddies in the uterine wall or in the uterine or pampiniform plexus, when during compression of the hypogastric or iliac vein some factor causes a passive dilatation of its peripheral portion. Compression-thrombosis in the uterus, on the whole, is rare, but is more frequent in the lower extremities. The thrombus formed, causes, in the first place, a retrostasis of the blood, and thus passive hyperæmias. If it remain normal it is harmless by itself, and by the immigration of wandering cells it is changed, probably with the aid of the endothelium and the vasa vasorum, into a firm connective-tissue cord. At times it becomes canaliculated, possibly by the passage of the red blood-corpuscles, so that the blood current passes through it.

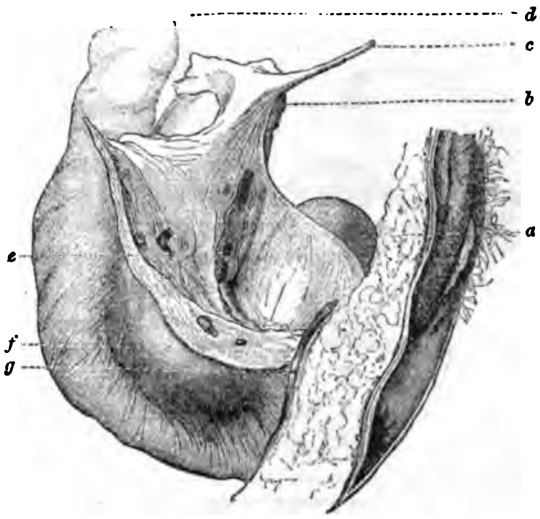
But if pus, and especially sanious matter, is near the thrombus, it suffers purulent and sanious decomposition, as Waldeyer has determined by experiment. Bubnoff has demonstrated that pus and connective-tissue corpuscles stained with cinnabar migrate from the neighborhood of the vessel wall into the thrombus and effect its suppuration. Accordingly, phlegmonous inflammations in the perivascular connective tissue will most readily give rise to purulent and sanious liquefaction of the thrombi. According to Waldeyer's investigations, however, we are also justified in assuming that an epithelial proliferation caused by inflammation in its neighborhood, that is, an endophlebitis, may secondarily give rise to the formation of thrombi.

When the thrombus has disintegrated by the penetration of products of decomposition, a putrid infection has arisen which is followed by putrid metastases; we designate this a septhæmia metastatica in contradistinction from pyæmia metastatica in which the thrombus as well as detached portions have been infected by specific organisms. Waldeyer, Recklinghausen and Klebs have positively demonstrated the parasitic organisms in the wound surfaces and in the metastatic foci.

The thrombus having grown by apposition in a central direction, often extends to considerable distance, and passes from the uterus either into the internal spermatic vein and as far as the vena cava, or into the hypogastric vein, the common iliac, and thence into the vena cava (see Fig. 179).

The intima in these vessels appears thickened, uneven, rough, with a greenish purulent infiltration. Sometimes the beginning of the thrombi can be easily followed as far as the placental site, sometimes the venous disease extends into the sanious patches in the substance of the uterus or into their neighborhood or into the ovaries. Recklinghausen once found its beginning in a softened corpus luteum. Around the diseased vessels we may sometimes discover parenchymatous abscesses in the uterine wall which usually spring from the adventitia. The inner surface of the uterus, however, is either altogether intact and relatively in good condition, or else the placental site appears covered with shreds of necrotic parenchyma coated with a blackish-brown slough; here and there are also some grayish-yellow ulcers with a firmly adherent deposit. The uterine parenchyma in that event is lax and

FIG. 179.



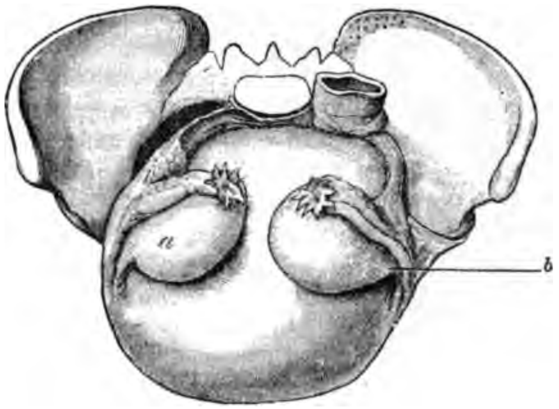
a, Bladder; *b*, uterus; *c*, round ligament; *d*, rectum; *e*, thrombosis of the arch between the spermatic, uterine, and other peri-uterine veins; *f*, exudation of cartilaginous hardness; *g*, thrombosis of the internal pudic vein; the thrombosed hypogastric vein was felt during life.

softened, infiltrated. The ovaries are swollen, enlarged and sometimes contain abscesses (compare Fig. 180).

The peritoneum in 40 per cent. of the cases is demonstrably more or less affected, and in 10 per cent. pronounced peritonitis is present. Hence, the name proposed by Buhl, "pyæmia without peritonitis," is not suitable.

By a purulent or sanious infection the thrombus is first softened in the centre, because there the bacteria immigrating from all sides accumulate; it then breaks up, whereby small particles, emboli, get into the blood current and are carried to various organs, most frequently the lungs. Such emboli, owing to the infection of the thrombus, have acquired phlogogenic qualities, and thus produce embolic foci in the lungs, which occur in 75 per cent. of the cases, and if they reach near to the pleura, are, as a rule, associated with pyo-fibrinous pleuritis. There are at times very numerous (according to Kiwisch up to 100) smaller and larger infarctions which may be recent or old, and range in size from a pea to a walnut or a hen's egg. These patches generally have a wedge shape, at first are dark, brownish-red, friable, and appear granular on section. In their centre arise yellowish-gray points, around which is a zone of yellowish-gray firm substance, then a reddish pneumonic one, and outside this a hemorrhagic zone. As the suppuration spreads over the entire infarction it assumes a more roundish form. When the infection of the emboli was sanious the metastatic infarctions in the lungs are likewise sanious, generally small and surrounded by slight pneumonic inflammations. The location of the metastases is most frequently in the superficial layers of the lungs, usually they are bilateral in the inferior lobes at their lower posterior sharp border; but they appear also scattered throughout the entire lung; they are hardly ever found in the apices. Hypostatic

FIG. 180.



Acute double oöphoritis in the thrombo-phlebitic form of puerperal infection. Abscess of the liver. *a* and *b* inflammatory swelling of ovaries.

patches of hepatization are found along with them. The bronchial mucosa is generally hyperæmic and swollen.

The stomach likewise at times suffers embolism of its vessels, in connection with which occur hemorrhagic infarctions and considerable, even fatal, hemorrhages (case from our clinic, see Ashton, above).

The spleen in metrophlebitis is always considerably enlarged, containing in 10 per cent. of all cases wedge-shaped infarctions; they resemble those in the lungs, but are usually roundish, they slough rarely and may be very numerous. The kidneys are generally hyperæmic, and next to the lungs are affected most frequently with metastases, in 14.3 per cent. of the cases. The liver is large, soft, variously filled with blood, the liver cells are enlarged, their contents opaque, the nucleus often indistinct, and many fat globules are visible in them. Metastatic abscesses in the liver (5 per cent.) are rarer than those in the spleen, and smaller than those in the lungs; they arise either from emboli which have passed through the lungs or from such as have broken from thrombi of the veins of the lungs, or, lastly, according to Busch (Berlin), from a reflux of the blood which carries emboli into the liver from the inferior vena cava (*C. Hueter*, l. c., p. 79). The intestinal mucosa is generally œdematous, the follicles and lymph glands are swollen.

Some authors (*Kiwisch, Virchow, Leyden, Buhl, Klob, Olshausen, Neville,* and *Notta*) have emphasized the occasional occurrence of endocarditis in thrombosis of the uterine veins, both on the left (*Virchow*) and on the right side (*Buhl*). This demonstrates another source of the origin of metastases; for in Buhl's case of endocarditis with thrombosis of the right ventricle and of one of the larger branches of the pulmonary artery, gangrene of the lung had ensued; and Virchow found an ulcerated inflammation of the mitral valve with detachment of fragments from the softened valve and metastatic foci in the heart muscle, in the kidneys, the spleen, the liver and in both eyes—the retina and choroid. Ollivier has also reported three similar cases in which the endocarditis was probably of puerperal origin in connection with other causes. The disease is said to attack chiefly the mitral valve alone or together with the aorta; to be subacute in its onset, with slight symptoms, and at times to arise already during pregnancy, so that hemiplegias during gestation are generally due to emboli following endocarditis. The affection is said to be invariably fatal. Virchow observed a number of cases in which the endocarditis occurred without uterine disease, especially in persons who had been attacked with a severe cold soon after delivery. He therefore looked upon such cases partly as of rheumatic origin, partly as a consequence of chlorotic conditions depending on abnormities in the vascular apparatus, for instance, narrowness of the aorta. The process on the valves at first was parenchymatous, the surface not appearing to be materially involved. But this stage lasts only a short time; it was followed, if the patient survived long enough, by small deposits of coagula (thrombi) of verrucose and polypoid masses. But the altered valve tissue showed little tendency to fibrinous thickening (sclerosis), which, if it did not lead to recovery, might at least serve to arrest the process; on the contrary, there was a remarkably frequent disposition to a form of ulceration with patches of softening followed by disintegration, so that firmer particles were detached. Numerous emboli resulted, especially in the kidneys, the spleen, the retina and the choroid.

Valvular endocarditis which occurs with ulcerous genital processes as well as with phlegmonous inflammation of the broad ligaments is marked by a peculiar malignancy of the succeeding embolic processes. Cocci have been repeatedly demonstrated in them, both in the thickenings of the endocardium and in the coagula of the heart, of the great vessels and in the pericardial fluid.

Olshausen was formerly likewise of the opinion that malignant ulcerous endocarditis was a disease *sui generis*, of whose causal connection with other puerperal affections thus far nothing was known (?), but now he shares the view (see Schröder's "Lehrbuch," tenth edition, p. 733) that it is merely a localized sepsis.

According to my experience, I can but echo this view. The duration of this disease ranges between 10 and 28 days. In 80 per cent. of these cases retinal hemorrhages occur (*Litten*).

The forms of ophthalmia (8.16 per cent.) occurring in metrophlebitis begin generally with great hyperæmia of the choroid, iris and conjunctiva; at times there are small extravasations of blood, but usually a diffuse suppurative inflammation ensues, in which the pus formed is deposited between the choroid and retina; the latter is perforated, the vitreous suppurates, the pus flows into the anterior chamber, perforates the cornea and the entire eye is destroyed.

The organs within the cranium are affected more rarely (in 4 per cent.) by the metastatic pyæmia starting from thrombosis of the uterine veins; but occasionally there was found extensive suppurative meningitis (*Erichsen*), meningitis after thrombosis, phlebitis and periphlebitis of the sinus of the sella turcica (*Leyden*), thrombosis of the right arachnoidal artery (*Virchow*) and thrombosis of the cerebral and meningeal veins (*Ducrest*). Mention must also be made of a thrombosis of the two internal jugular and subclavian veins extending to the superior vena cava which McClintock discovered in connection with an abscess of the right auricle, being evidently a puerperal thrombosis; in this case the vertebral and external jugular veins had permitted the reflux of the blood from the brain.

Metastatic inflammations and suppurations of the glandular organs on the whole are rare, but may affect the parotid, the mamma, the thyroid and the tonsils.

The external integument may show diffuse erysipelas or miliary or varioloid exanthems or large purulent pustules. Very often (in 21.6 per cent.) we also find inflammations and suppurations in the articulations, especially in the shoulder, elbow, wrist, knee, hip, sterno-clavicular and pelvic joints. The synovial membrane is usually thickened, reddened; the cartilage appears unchanged or slightly opaque; sometimes the cartilage becomes necrotic and may be followed by caries of the bone with external perforation of the pus. In 22 per cent. of the cases numerous abscesses of the muscular or cellular tissue occur; they usually spring from the muscular connective tissue.

The frequent occurrence of miliary abscesses proves that in this puerperal pyæmia we have to deal, not with the wedging in of large masses, but with finely divided molecular substances. The metastatic inflammation of the joints, the pleural cavities, the subcutaneous and the intermuscular connective tissue and of the skin likewise indicate that the infectious material is often carried to the affected regions in a finely divided form.

Symptoms.—When a thrombosis of the placental site or the uterine wall has developed, and purulent or putrid infection of the thrombi follows, further consequences sometimes occur very rapidly, say after 24 to 48 hours, in the puerperium. Usually, however, they develop more gradually from apparently trifling symptoms, especially those of endometritis and parametritis, now and then even after a quite satisfactory condition of the patients, at a later period, when they have commenced to leave the bed. In such cases we may learn subsequently that they had felt before somewhat weak and debilitated, now and then had a slight chill or profuse sweats or a sense of heat, without having paid attention to it until some day a more profuse hemorrhage or a sudden acute abdominal pain with violent fever and an intense rigor had occurred. The first most important and terrible symptom is almost invariably intense rigors, which, as a rule, are not only prolonged, often lasting several hours, and very severe, but they recur with uncommon frequency. They are followed by profuse, very weakening sweats with resulting miliary eruption. The lochia is usually sanguineous, mixed with small coagula, more rarely offensive, and may be free or scanty. The abdomen at first is soft and yielding, and only the uterus is sensitive on pressure. As the rigor subsides and the temperature begins to fall, the patients revive, become more lively, have some appetite, feel relieved and are free from pain. But if the chills recur, as is generally the case, the patients visibly lose ground; the skin becomes limp and sallow through rapid emaciation; sleep and appetite are lost; great thirst, more rarely vomiting and intense headache annoy the patients; great anxiety is marked in the features, and even in the intervals between the rigors they react but slowly, and are always in dread of the recurrence of the frightful chills.

Sometimes neuralgic affections of one or both lower extremities, œdema and impaired mobility of the feet, occur early; also peritonitic symptoms—

abdominal pain, diarrhœa and vomiting. In a few cases a diffuse peritonitis precedes the puerperal metastatic pyæmia; this having been followed by a fall of temperature, the remaining uncommonly great frequency of the pulse, the loss of sleep and the great excitability indicate that there is still some disease, which usually manifests itself by renewed chills and the succeeding metastases.

A symptom which comes more frequently under observation is intense icterus, sometimes even at the very onset of the affection. The stools are at the same time bile-stained. At times the metastatic diseases occur within the first twenty-four hours, especially in the lungs; much accelerated respiration, attacks of dyspnœa, cough, stitches on inspiration; later, expectoration of bloody, rusty sputa accompany it, but the sputa are by no means always characteristic. Furthermore, diseases of the eyes appear, the conjunctivæ swell, become chemotic, hypopyon sets in on one or both sides, and the patients lose the sight of the affected eye. Sometimes this condition improves, the pus again disappears from the anterior chamber, and perception of light is regained. But now the joints swell and are exceedingly painful with every movement; they become red, and exudation soon takes place in them. These affections, too, decline and other parts are attacked; on the extremities, isolated, red, brawny spots appear on the skin, or elevations with distinct fluctuation, while the skin is still pale. An incision often gives vent to large masses of thin, fluid, offensive pus, mixed with blood.

In this way, with frequent rigors and violent pains, puerperal metastatic pyæmia may kill the patients gradually, often in the course of weeks, and even months, by the exhausting fever. In the intervals of the several paroxysms the condition may at times again appear tolerable, and the patients feel encouraged, until a renewed metastasis or a recurring chill takes away all hope. It is notable that the patients usually soon perceive the danger of their condition, and hardly ever exhibit the euphoria which is so characteristic of the other forms of puerperal mycoses.

Frequently, however, the process terminates much more rapidly. Sudden death occurs with embolism of the pulmonary artery, with dyspnœa, oppression, cyanosis and opisthotonos; or after an intense rigor, bloody expectoration, dyspnœa, cough, chills, etc., set in, and we recognize at some part of the thorax dullness and often crepitant râles; this is soon followed by collapse, renewed rigors, delirium, stupor and death. Sometimes, despite pulmonary metastases, there are no stitches, no cough and no expectoration. The time when the pulmonary affection occurs varies greatly and depends upon the condition of the primary thrombus; the .more rapidly it becomes softened and undergoes purulent degeneration, the sooner metastatic foci may form in the lungs; if they are numerous and the thrombus becomes sanious and pulmonary gangrene develops, death usually occurs very soon. The lungs are more frequently first affected, because the emboli pass most readily and directly from the spermatic veins and the inferior vena cava into the right heart and thence into the capillaries of the pulmonary artery, where they meet the first resistance. Puerperal metastatic pyæmia differs from that occurring after injuries, by the lungs in the latter being more frequently intact, while the kidneys are three or four times more often affected with metastatic disease (compare *C. Müller, l. c.*).

Although in these diseases death may usually be expected, the author has observed many cases (25 per cent.) in which a pronounced metrophlebitis with numerous metastases and frequent chills still terminated in recovery. Moreover, in autopsies on parous women unquestionable proofs of a healed phlebitis have been found, while on the other hand cases of this kind which recovered have been published in the literature, and in which there can be no doubt as to the diagnosis of the disease (see above, the cases of *Beitler, Hervieux, Playfair* and others).

Multiple metastatic foci toward the exterior are the most favorable as regards the secondary affections.

The duration of the disease is on the average 18.5 days. The chill which may be certainly attributed to phlebitis may occur on the first day after labor. In 75 per cent. the chills begin to appear in the first week of the puerperium. Death occurs most frequently in the second and third weeks.

As regards the fever which accompanies this pernicious puerperal disease, even the older physicians knew that the chills sometimes occurred in an approximately regular type, and therefore they called this affection: "intermittens maligna puerperarum." In the cases which remain for some time free from all complications the type of the fever is generally as follows: at first it is continuous or slightly remitting; then after the more intense rigors very considerable remissions or even complete intermissions set in. Before, during, and for some time after the chills the pulse is usually very frequent, in the intervals it slows again at first. With the onset of a new chill, pulse, respiration and temperature rise respectively to 120–140, 36–56, 104–106° F.; they are often followed by an equally rapid fall to the normal. Such intermissions may occur repeatedly; but finally the fever becomes continuous, viz., as soon as the metastases have formed. The fever may remain unchanged till death or toward the end there may be a gradual fall of temperature which is sometimes even associated with a decline in the frequency of the pulse.

But if metastases occur early, the intermitting stage of the fever is at times lacking altogether and only well-marked, irregular remissions are demonstrable. For accurate investigations of the temperature in these diseases we are indebted especially to Leyden who repeatedly observed remissions from 104° to 98° F. in a single day. His observations have been confirmed by the author, Veit, Schröder and others.

The height of the fever and the rapid rise of the temperature first evoke the chill; the large number and intensity of the rigors is explained by the more or less frequent and numerous penetrations of the purulent or putrid infected emboli and fluids into the blood; hence they generally precede renewed metastates. Whenever those putrid fluids or remnants of the thrombus have found lodgment in some place, the fresh exacerbation declines and recurs only with the renewed entry of such masses. Each new focus is an additional factor in the production of the fever, but the number of chills does not correspond to that of the metastatic foci, and I have observed cases with very numerous metastases in which not a single characteristic rigor had occurred.

Formerly it was customary to explain in like manner the icterus, which was conceived as hæmatogenous in consequence of the destructive effect of the putrid materials on the blood-corpuscles. This opinion was based mainly on the fact that usually no gastro-duodenal catarrh was present in these cases. But Virchow has made this view appear questionable and attempted to explain even this form of icterus as hepatogenous by a mechanical obstruction in the intestinal portion of the ductus choledochus. The liver in such cases is found here and there quite light yellow, in a state of fatty degeneration; the parenchyma is soft, the liver cells are granular, in a state of complete disintegration. Buhl has shown, besides, that in metastatic pyæmia a disintegration of the cells, quite similar to that in acute atrophy of the liver, occurs also without icterus. The urine distinctly shows bile pigment, some albumin, but no bile acids (*Leyden, loc. cit.*, p. 12); it has a high specific gravity and is deficient in chlorides.

As regards the *diagnosis*, the rigors furnish a very valuable and, as a rule, the most important characteristic symptom, but their absence by no means excludes the existence of a metrophlebitis. On the whole, the diagnosis of the affection is easy whenever frequent rigors occur. From a quotidian intermittent it can be distinctly differentiated by the irregular chills, the irregular fall of temperature, and the metastases. Formerly this affection has been frequently confounded with intermittent fevers, and it is quite likely that many a reported cure of an intermittent in the puerperium was really a cured metastatic pyæmia. In order to recognize the great remissions or intermissions of the fever, the thermometer must be used at least three or four times a day, especially at noon and during the night. Sometimes, though very rarely, it is possible to feel the thrombosed vessels of the broad ligaments distinctly through the vaginal vault or per rectum. In the case illustrated in Fig. 179, I was able to recognize the thrombosed vessel distinctly in the right vaginal fornix. Sometimes the common and the external iliac vein can be recognized by touch on the ilium, that is, so long as the abdominal walls have not become œdematous and swollen, or tense owing to considerable pain. Of course, such palpation must be done with the greatest care, lest the finger crush the thrombi and cause the carrying away of their fragments. An important landmark in the diagnosis of thrombosis of the uterine vein is furnished, furthermore, by phlegmasia alba dolens, which frequently occurs secondarily in connection with it. Oft recurring hemorrhages from the uterus, if no other cause can be ascertained, should likewise point to the danger of a thrombosis. Particularly in cases where the process is more insidious and the rigors occur only after the patients leave the bed, the use of the thermometer is very valuable, since it gives us at least some points of information by the course of the fever, before pronounced metastases have formed. The diagnosis is especially difficult when the metrophlebitis is associated with other diseases, particularly phlegmonous metritis and thrombosis of the lymph vessels; for then the latter predominates so frequently, and so largely influences the rapid course, that the former is likely to be overlooked until found at the autopsy. This is the reason, as Kiwisch has pointed out, that in the books of former authors the symptomatology of phlebitis is so confused, the symptoms of the complications being interwoven with the general characteristics of the disease. On the other hand, this fact furnishes an explanation of the frequency of metrophlebitis in the older reports of clinical institutions, where it is mentioned, for instance, almost as often as peritonitis, while it is much rarer and occurs also less commonly than pure phlegmonous puerperal affections. The recognition of metastatic foci in the lungs is often difficult. When they are larger, we find, of course, some dullness and pleuritic friction sounds; but in the case of scattered, small, non-aërated portions, the pitch merely becomes higher without being dull. Expectoration is often absent, not always pneumonic, and the great frequency of respiration, though common, is not constant. Hence, a negative result of the examination of the lungs does not exclude the presence of metastatic foci. The diagnosis of endocarditis can be made, not from heart murmurs, not from enlargement of the organ, but usually only from the general symptoms, the early occurrence of brain symptoms, and diseases of the eye. After what has been stated, the diagnosis of the affection is indeed often difficult, but it is not, as Kiwisch, Scanzoni, Hugenberger and others maintained, unreliable, and we are forced to assert that in a large number of cases it can be positively made, as we have done in several and confirmed it post-mortem.

Etiology.—In the first place, there can be no doubt that puerperal venous thrombosis likewise is much more frequent at times when other puerperal diseases are prevalent than otherwise. For the same causes which infect the raw surfaces of the vagina and uterus may also produce disintegration and sloughing of existing thrombi, with succeeding embolism, pyæmia and septicæmia. Hence we meet with the latter in cases of endometritis and colpitis mycotica, in parametritis and in gangrene of the vulva, vagina and uterus.

Sporadically, it develops as thrombosis of dilatation with and after profuse hemorrhages from the uterus, after atony of the placental site, after placenta prævia (compare *C. Müller, loc. cit.*). Great losses of blood reduce the contractility of the uterus and the heart, the vis a tergo decreases, and consequently there are formed more numerous and longer thrombi, by which the danger of pyæmic infection becomes greater. This is the case, too, when, during the detachment of the afterbirth, remnants of the placenta and membranes have been left behind; for the former, protruding into some of the venous trunks, prevent their contraction and keep them open so that the blood coagulates in them; on the other hand, their decomposition easily causes putrid disintegration of the formed thrombi, and this applies also to the remnants of the membranes. Compression-thrombosis develops after lesions and contusions of the walls of the veins, whether by portions of the child or instruments during labor—that is to say, mainly after instrumental deliveries, and with exudations near the large venous plexuses.

Generally, however, several causes coöperate; for, as stated above, putrid metritis and phlebo-thrombosis develop by no means always when remnants of the placenta have remained behind, but the nature of the uterine contractions, preceding diseases of the endometrium, the amount of blood in the retained masses, and their connection with the uterine wall, contribute materially to the establishment of the disease. It is equally frequent in primiparæ and multiparæ. Its frequency compared with the phlegmonous processes is about as 1 : 7 to 9. Kiwisch stated that it was to be found mainly toward the end of greater epidemics. Outside of these, it is met with much more rarely. About 14 per cent. of the cases of metrophlebitis are associated with phlegmasia alba (compare *C. Müller, loc. cit.*). Among 216 deaths of parturient women I found the pure thrombo-embolic form twenty-four times, and seventeen times complicated with the lymphatic form.

The *prognosis* is very bad. Recovery is rare and the sufferings of the patients are often terrible. We must beware of predicting too early an improvement from a considerable remission in the temperature, but should rather call the attention of the family in time to the great danger, and particularly emphasize the fact that deceptive improvements take place which should not give rise to unfounded hope. Intermissions of the fever associated with corresponding decline in the frequency of the pulse give a better prognosis than if occurring alone. The more intense the rigors, the more prolonged and frequent they are, the sooner and more numerous do the metastases set in. The worst metastases are: extensive pulmonary infarctions with pleuritis, and thrombosis of the cranial veins. Intense icterus is very serious. Kiwisch has stated that he has never known of a recovery after metastatic ophthalmia, nor do I know of any except the case of Cortejarena. Multiple glandular and cutaneous abscesses are more favorable. We are really justified in a hope for the better only when the rigors cease for days, the temperature gradually declines, the general health improves, and existing metastatic foci are recovered from. Olshausen observed a recovery in a case of pyæmia of the highest degree following perineal laceration, although the six larger joints of the lower extremities underwent purulent inflammation and became completely ankylosed. As a rule, more than 95 per cent. of the patients succumb. In comparison with metrophlebitis, phlegmasia alba dolens is far less dangerous, though in the latter, too, very extensive, long and thick thrombi with periphlebitis and endophlebitis are often found. But as in the former condition the thrombosis starts most frequently from the placental site, where the thrombi are always more or less exposed to injurious influences, this will explain the more pernicious character of metrophlebitis. Moreover, the internal spermatic veins undergo so great a development and expansion during pregnancy that they become valveless and predisposed to coagulation; and through them the thrombosis may continue toward the heart and the embolus be carried into the lungs more easily and quickly than through the hypogastric, crural and external iliac veins, the road being shorter and more direct.

Treatment.—In the way of prophylaxis, labor, and especially the third stage, should be watched so as to counteract all factors which might give rise to considerable uterine hemorrhages. The development of an endometritis or parametritis should be combated as early as possible, and the disintegration of the formed thrombi guarded against by exciting uterine contractions, or by antiseptic treatment when the lochia is putrid. We must be particularly cautious in giving permission to leave the bed, and should not allow patients who had high fever or after-hemorrhages in the first days of the puerperium, or are debilitated, to get up on the ninth day after delivery. Anæmic parturients should be strengthened from the first days post partum by a roborant diet of bouillon, milk, eggs, beer and wine, and the force of the heart should be supported; patients who are weak, with a tendency to syncope, should early receive subcutaneous injections of ether beneath the loosely adhering skin of the scrobiculus cordis. Finally, we must remove everything which may increase the congestion of the pelvic organs and hinder the reflux of the venous blood, such as constipation, ischuria and cough; we must forbid exertions in the handling of the child, frequent sitting up in bed, etc. In this way we may succeed in preventing the affection in many cases.

But if thrombosis and disintegration of the thrombi have set in, there is no remedy which can certainly arrest the further consequences. Least of all will local or even general abstraction of blood be indicated. There are far more advocates of the use of mercurials for puerperal venous thrombosis in the manner described above under the head of Phlegmonous Metritis. I am convinced that we are justified in employing mercurials. Although we do not not yet know fully how they act, it is certain that they moderate the swelling, the infiltration in the neighborhood of the thrombosed vessel, and the soreness of the affected parts; it is an open question whether they, besides, neutralize the putrid materials by passing into the blood. It is proved, at all events, that they have been used by many with advantage, and I, too, have employed them repeatedly with good results; of course, chiefly endermatically, that is, one gram rubbed every two hours into the thighs until salivation commences, which often does not occur until after eight or ten days. The metastatic articular abscesses heal sometimes by absorption, with or without ankylosis; if the abscess is rather large it must be incised and treated antiseptically or resection be done. For painful spots on the skin we order lead-water applications or wrapping in cotton wool and secure an easy position for the affected extremity.

Internally, mineral acids—phosphoric, muriatic, sulphuric—are to be recommended for their refreshing, cooling effect, and in conjunction with them quinine. Its best result is the diminution of the intense rigors; but we must expect nothing from small doses and give large quantities at once—1 to 1.5 gm., best in wafers; if excitement and restlessness coexist, it is advisable to add small doses of morphine. Thus in several cases I have gone as high as 6 gm. of quinine within a few days, and observed that the rigors diminished at first, and subsequently ceased altogether. From January to March, 1875, I treated in Dresden a parturient suffering from metastatic pyæmia who had four rigors daily and received, from January 22d to February 22d, 25.5 gm.; from February 23d to March 7th inclusive, 28 gm.—altogether until she recovered 53.3 gm., some days as high as 3.5 gm., which were well borne. In the gravest forms of puerperal fever no other remedy can take its place, for the effects of antifebrine, antipyrine and phenacetine cannot be compared with it. When danger is imminent, we must not be deterred, by the injurious effect of quinine on the ear which is not constant, from the use of large doses, since small doses are powerless.

Easy and ample evacuations are secured by cathartics and enemata. The diet should be liquid, nutritious, and be given every two hours in small quantities; for drink, lemonade and water with fruit juices. When the strength declines rapidly, we must resort to more powerful stimulants and give wine, especially champagne, a tablespoonful every half-hour. The position should also be considered: the patient requires a horizontal easy couch and should be free from any pressure by heavy coverings. A cool temperature of the room and fresh air are grateful to the patient.

I can confirm the good effect of warm full baths on the rigors, in corroboration of Kiwisch's statements: the chill becomes less severe, the sweat less exhausting, the dry harsh skin grows softer, and the patients feel much easier after the bath. Priessnitz's packs and cold affusions are, as I have found in several cases, very agreeable to the patients and temporarily reduce the high temperature.

6. Puerperal Diseases of the Thighs: Phlegmasia Alba Dolens and Phlegmone Cruralis in Puerperio.

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We can distinguish two forms of this affection, namely:—

1. Phlegmasia alba dolens *with* venous thrombosis; here the venous thrombosis is the primary condition which has been followed, owing to the purulent disintegration of the thrombus, by a periphlebitis with succeeding phlegmonous disease of the affected extremity.

2. Phlegmone cruralis *without* venous thrombosis; a phlegmon of the thigh with primary disease of the skin or the subcutaneous and intermuscular cellular tissue, for instance, in the course of parametritis, in which the vessel walls may take part, when at times even secondary thrombi form in them; but in which they are not always implicated.

The venous thrombi in the thighs may develop either primarily or secondarily. Primarily, they form even during pregnancy, very frequently by the pressure of the enlarged uterus on the iliac vessels, thromboses of dilatation, whose extension may completely plug the affected vessels during pregnancy or a short time after delivery. Such thrombi may develop in the saphenous, the tibial and peroneal veins. Secondarily, they develop, after thrombosis of the hypogastric vein, in the crural vein as far as Poupart's ligament, or still lower; also after thrombosis of one of the internal spermatic veins whenever the thrombus of this vessel has extended into the vena cava and obstructed it. Hence they not rarely follow placental thrombosis or obstruction of the pampiniform plexus. When the crural and external iliac veins are plugged, the venous blood passes through the epigastric, or the circumflex ilium and ileo-lumbalis, or through the gluteal veins. The congestive hyperæmia in such cases becomes so great for some time that not only blood plasma exudes and causes the œdematous swelling of the leg, but, as Cohnheim proved by ligation of the femoral vein in frogs, also the red blood-corpuscles are forced out into the parenchyma through the stomata of the capillary epithelium. E. Martini, whose untimely death we deplore, examined in one of my cases the muscles of the diseased extremities with the microscope—namely, the rectii abdominis, the pyramidales, the sartorius, the tibialis posticus, the flexor digitorum communis, and flexor digiti hallucis. In all the muscles the striation was indistinct and obliterated, which fact could not be ascribed to a very close approximation of the transverse striæ, and for the same reason the primitive bundles were not particularly lustrous. In place of the transverse striation there was usually, especially in the rectus on both sides, as well as in the pyramidales and sartorius, a distinct longitudinal striation with division into fibrillæ, which ran an undulating course. The majority of the fibres showed granular opacity, many were atrophic, so that the cross-section of the primitive bundles was diminished to about one-half and two-thirds of the normal, particularly in the rectus and pyramidalis. The nuclei of the primitive bundles had proliferated considerably and lay in long rows one after the other in the granular substance. Their size was not great, their form roundish or elongated, with several nucleoli. In the muscular bundles of the leg there was found, besides overfilling of the capillaries in the muscular tissue, the well-known brown pigment, deposited partly in roundish and elongated small heaps, partly in larger ones. The muscles, on the whole, could be easily teased, but were not particularly friable. The granular substance was partly soluble in concentrated acetic acid, therefore was an albuminoid substance; partly it was to be considered as fat. The thrombus may undergo the same changes in the veins of the thigh which have been described as taking place in the uterine wall (see page 815).

In phlegmasia alba dolens, therefore, all of those metastatic diseases of the lungs, heart, spleen, kidneys, liver, brain and extremities, which have been described under pyæmia arising from venous thrombosis of the uterus, may also occur.

The second form of phlegmasia alba dolens, which begins without thrombosis, is a phlegmon of the thigh. It extends from the abdominal walls or genitalia, perineum and nates, to the upper thigh, either on one or both sides. The limbs become swollen, the skin looks pale or slightly reddened, tense and thickened. The subcutaneous cellular tissue is œdematous. When the swelling is marked, vesicles containing clear serum form here and there on the skin; they burst and exude fluid. The affection of the connective tissue extends to the intermuscular tissue and the sheaths of the vessels. Abscesses develop here and there in the latter after the swelling, and, at the same time, the inguinal glands also grow larger. These are the cases in which lymphatic vessels, as well as veins, are thickened, and thrombi may form secondarily in the former. But, as Lee had shown, there is occasionally considerable inflammation of the adventitia without extension to the inner surface of the vein, or without change in its contents. The layers of exudation that have been formed either suppurate rapidly, undermine all the muscular layers, isolate the vessels and perforate the skin, or necrosis and gangrene of the skin, cellular sheaths and muscles develop, with subsequent blood-poisoning and death.

Symptoms.—Thrombosis of the veins of the thigh may develop even during pregnancy. The patient then, as a general thing, feels pain at the place where the thrombus is situated, and a certain rigidity of the foot, toes or dorsum of the foot. When the thrombosed vessels are superficial, the overlying skin is reddened, swollen, painful on pressure; there is frequent febrile movement. The formation of thrombi may also occur during the first days of childbed, and is occasionally primary, without any notable prodromes. But this is rare, on the whole, and appears only in complications with other diseases, or when the thrombosis had begun during pregnancy. A frequently overlooked prodromal stage consists of gastric disturbances: pressure in the epigastrium, with loss of appetite, thick gray coating on the tongue, bitter taste, eructations and obstinate constipation. Swelling of the thigh sometimes begins only after repeated chills, and after thrombosis of the pampiniform plexus, internal spermatic or hypogastric veins has lasted for some time. As a rule, the phlegmasia alba dolens which follows the thrombosis begins in the second week after childbed, after the woman has felt for some time a certain lameness in the leg, and even pain in uncomfortable positions. At first these pains are felt particularly in the calves. Then the leg begins to swell, in primary thrombosis chiefly around the ankle, then extending to the knee, and finally to the inguinal region; in secondary thrombosis it extends quite rapidly from above downward, and the œdema even spreads to the lateral parts of the abdominal walls. The entire limb increases considerably in circumference, becomes pale or pale-red, tense, and is moved with difficulty. The patients complain of tearing pains in the part. With the increasing swelling and tension, vesicles form upon the skin; these rupture, the epidermis is exfoliated, and suppurating places remain behind, or certain parts grow redder, and perforation occurs, with evacuation of pus externally. When the swelling on one side has reached its height, the other thigh may also begin to swell, and the same phenomena develop successively in the latter; the symptoms in the former either diminish or they continue for some time. If repeated chills occur during the swelling of one or both thighs, then, as a rule, metastases of the most varied kinds soon follow.

In uncomplicated venous thrombosis with phlegmasia alba dolens, the fever is first a remittent continued fever, then irregularly remittent, then intermittent, and finally falls slowly to the normal, long before the swelling of the limb has disappeared. But if metastases develop, the type of fever becomes continued, interrupted occasionally by marked remissions. So long as secondary affections of other organs have not developed, the pulse and respirations usually exhibit only a moderate frequency, the former from 92–116 beats a minute, the latter 20–30 times a minute. Diuresis diminishes considerably, the urine has a high specific gravity, contains a large amount of urea, but very little sodium chloride, and often traces of albumin. When the disease begins early, the lochia are unchanged or are merely somewhat more scanty than usual. During a chill they often become bloody. The evacuations from the bowels are retarded, and diarrhœa occurs only in putrid infection.

The *terminations* which this form of phlegmasia may have are: 1. Complete resolution (in 68.5 per cent.). 2. Abscess formation, prolonged suppuration and recovery (this is rare, but has been described by many authors, such as Struve, Hosack, Simmons, White, v. Siebold and the author). 3. Death from gangrene of the affected limb (*Davies*, *Boër*, *Burns* and the author). Recovery, with complete disappearance of the swelling, may be completed in three to six weeks. Death occurs, usually, between the ninth day and the sixth week, occasionally even later. It very rarely occurs earlier when complicated with other diseases. 4. According to Mauriceau, Boër, Casper and Gittermann, a greater or less degree of paralysis of the affected limb is sometimes left over. 5. Finally, it must be mentioned that some writers, such as Chevalier, Fricke and others, have seen the swelling last for years, and even pass into a sort of elephantiasis. I have observed a patient who, for years after the disease, suffered at times from swelling of the formerly affected limb.

In the second form of phlegmasia, which begins with disease of the skin and subcutaneous cellular tissue, very acute pains soon appear, with livid redness, high, continued fever, and the formation of vesicles on the skin, together with gangrenous destruction or the development of abscesses. If the necrotic masses of cellular tissue are exfoliated after the evacuation of the pus from the subcutaneous tissue and the spaces between the muscles, recovery gradually occurs; if the disease is very extensive and spreads deeply, death occurs from gangrene and septicæmia.

Diagnosis.—The diagnosis of phlegmasia alba dolens is not difficult. The swelling of the limb at the parts first affected is shining, usually firm, tense, occasionally does not pit under the pressure of the fingers. Other parts of the affected limb are distinctly swollen; for example, at the beginning of the swelling in the groin, at the ankle, on the abdominal walls. The inflamed or thrombosed vein can sometimes be felt in the calf or the popliteal space before the swelling appears. If the vein lies near the skin, the latter is usually reddened, swollen and painful. . In many cases, when the leg is not seen until it is greatly swollen, it is difficult to decide whether venous thrombosis is present or not. But in the former event the development of the swelling is usually slower, attended with less pain, and, at first, with less redness. Even then we can sometimes succeed in feeling distinctly the vessel filled with the thrombus, for example, the external iliac and crural veins, and occasionally we can even discover a thrombus in the utero-vaginal plexus or the hypogastric veins. But, if this is not the case, irregular marked remissions, frequent severe chills, and, in affections of the deeper veins of the thighs, a certain firmness and elasticity of the swelling, point with probability to a venous thrombosis. In addition, it must be remembered that this occurs much more frequently than the second form, phlegmon of the thigh proper.

Etiology.—As regards the causes of the disease, R. Lee found it, among 100 cases, 60 times in puerperal women, 40 times without previous parturition ; in the majority of cases the sufferers had one or two children. Protracted labors were observed repeatedly in these cases. In more than two-thirds of all the cases the disease began within the first 21 days of childbed. It was situated 33 times on the left side, 23 times on the right. Perhaps the more frequent occurrence of the first vertex presentation during labor is not devoid of significance in regard to the greater frequency of venous thrombosis in the left thigh, as was pointed out by Velpeau.

The presence of large varicose veins in the thigh always furnishes a certain predisposition to thrombosis. If contusion of such parts occurs from a blow, push or pressure, or the already existing thrombi increase after profuse hemorrhages, periphlebitis with its sequelæ may set in. Pelvic exudations often exercise pressure on the large veins, which is especially apt to lead to the development of thrombi. How often the phlegmasia is secondary to thrombosis of the hypogastric or internal spermatic veins, cannot yet be told with certainty, because the published cases have usually been reported too inaccurately to determine the relation of secondary to primary thromboses of the thigh. Many cases reported by Boehr, Sankey, Davis, Puzos, Treviranus, Struve and the writer, prove that the disease often extends from one thigh to the other. Baart de la Faille reports an especially interesting case of this kind, in which the left vena saphena minor was the starting-point. The thrombus extended through the crural, common iliac and vena cava as high as the first lumbar vertebra, and the right common iliac vein was also occluded. In this case the vena azygos and hemiazygos were greatly dilated ; the affection of the right limb appeared 12 days after that of the left.

As a matter of course, the subsequent affection of the hitherto healthy limb may also result from genuine disease, but it is not improbable that it occurs more frequently when the thrombus, projecting from one common iliac vein into the inferior vena cava, blocks the lumen of the other common iliac, and narrows or even completely obstructs it.

Colds, errors of diet, emotional excitement, too early and severe exertion, failure to nurse the child, are mentioned as exciting causes of phlegmasia. These causes obtain in so far as they may cause obstruction to the circulation, especially slowing of the venous current. But the relative frequency of these venous thromboses in puerperal women is explained less by the condition of the blood, the so-called leucocytosis, and rather by the interference with the venous current as the result of pressure and the dilatation of the veins during pregnancy. The same changes, which we have described with regard to the lower limbs because they are found there most frequently, also occur in the upper limbs, and from the same causes.

The second, much rarer form of phlegmasia, complicates existing puerperal ulcers and diseases of the external genitalia, or it accompanies a mycotic endometritis. Hence it often extends out of the pelvis below the groin or nates, but in rare cases may appear primarily, from unknown causes, in very obese or feeble individuals.

On the whole, phlegmasia alba dolens is an infrequent affection, although it sometimes occurs more frequently under epidemic conditions, like placental thrombosis and in conjunction with the latter. For example, Leyden observed it five times among 83 cases of disease, but its occurrence in general cannot be inferred from this statement. Other writers, who experienced large epidemics, observed it very rarely. In 26 years, El. v. Siebold saw it five times, Velpeau only five times in a long series of years, and Trevianus only once, in a puerperal woman, in the course of thirty years.

Prognosis.—Phlegmon of the thigh without venous thrombosis is always of a very grave character, especially in already exhausted individuals. Death occurs very often and with unusual rapidity. Protracted suppuration, great exhaustion and even contractures from cicatrization are left over in the most favorable cases.

Phlegmasia alba which has followed venous thrombosis, must also be regarded as a serious and dangerous disease. But it is by no means as grave as thrombosis of the uterus and its plexuses, and only about 33 per cent. of the cases terminate fatally. If the reported cases, in which thrombosis of the crural vein followed a previous thrombosis of the hypogastric vein, could be sharply separated from those in which the thrombus appeared permanently in the veins of the thigh, the prognosis of the latter might, perhaps, be expressed even more favorably. It is hardly to be doubted that, with the increasing distance of the thrombi from the inner surface of the uterus, the danger of the purulent or putrid degeneration of the former constantly diminishes. It is noteworthy that, according to the experience of several authors (*Macneveu*, *Struve*, *Carlander*), the phlegmasia may recur in a patient in several successive childbeds. The more frequently chills appear, the more the limb swells, and the earlier vesicles form upon the integument, the more unfavorable is the prognosis. It becomes favorable when the chills are infrequent and the swelling begins to subside, with gradually diminishing range of temperature. But even then, metastases and sudden death from embolism of the pulmonary artery may result. In the phlegmasia which accompanies metrophlebitis, the disease often lasts only a few days. The earlier the metastases set in, the earlier does death occur; but recovery takes place occasionally, despite the secondary affection of many other organs.

Treatment.—As a matter of course, the prophylaxis and internal treatment of phlegmasia alba are the same as in thrombosis of the uterine veins. As regards the treatment of the affected limb, a good position is the first necessity. The leg is placed a little higher than the thigh, and the knee is slightly flexed; by means of pillows on the sides, the foot itself and the calf are supported in such a way that the former will not rotate outward by its own weight. So long as the limb is greatly swollen, tense and painful, relief can be secured by compresses of lead wash. If the pain is very violent, narcotics are given internally, and tinct. thebaica added to the lead wash (30 : 500 aq. plumbi). Vesicles are opened by small punctures, and the serum allowed to escape. Inunctions into the thighs are dangerous in thrombosis, because pulmonary embolism may be produced. When the pain and swelling diminish, we may venture to hasten the diminution of the swelling by careful bandaging, but the bandages must be removed at once if they increase the pain.

Latour, who first recommended the use of collodion against puerperal peritonitis, also treated, with excellent results, a case of puerperal phlegmasia alba by brushing the diseased limb with a layer of collodion mixed with castor oil (*L' Union Médicale*, 7, 1861). I have also tried this plan in one case, but only prevented an increase of the swelling, and did not secure any diminution of the pains or increase of mobility. At the present time venesection is no longer employed in this disease.

The patients should not leave the bed until they have been free from fever for some time, and the swelling of the limb has almost entirely disappeared. Elastic stockings are worn or a bandage is carefully applied before the patient gets up, and finally the former mobility may be completely restored by careful massage.

The treatment of puerperal phlegmon of the thigh, which begins without thrombosis, must be inaugurated by early, free, long and deep incisions through the diseased integument in order to relieve the swelling, and evacuate, as soon as possible, the pus which has been formed. The wounds are then irrigated with carbolic acid, drained, and treated with iodoform powder.

7. External and Internal Puerperal Erysipelas.

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The admirable investigations of Fehleisen first showed that one erysipelas virus is found in the lymphatic vessels of the skin and subcutaneous adipose tissue, but especially in those of the more superficial layer of the corium, as a chain-forming micrococcus, which fills these vessels. When present in especially large numbers, it also is found in the lymph spaces and juice canals of the skin, but, contrary to the statements of Lukomsky, Billroth, Ehrlich and Tillmanns, not in the blood-vessels. This chain-forming micrococcus grows especially well on coagulated blood serum, at the temperature of the incubator, and at the end of twenty-four to thirty hours forms fine white specks and dots, which coalesce into an opaque white patch which lines the point of puncture. A standstill in the development of the punctures occurs in about six days. These erysipelas cocci are perfectly immovable, and their exanthropic spread is made probable by the fact that they can be cultivated not alone on coagulated blood serum and nutrient gelatin, but also on potatoes at the ordinary temperature. The proof that this bacterium is pathogenic of erysipelas was furnished by Fehleisen by means of inoculations of rabbits with pure cultures of different generations, and also of different individuals who were inoculated with cultures of the fourth, ninth and fourteenth generations. Among seven inoculated individuals, six were attacked with erysipelas; the only patient who remained free, and who did not react to two inoculations, had suffered formerly from habitual erysipelas, and had had facial erysipelas two to three months before.

But numerous direct attempts at inoculation from man to man, made in the most various ways, were always attended with negative results. Hence, it seemed as if the danger of infection by erysipelas patients is not very great. As a rule, erysipelas furnishes no secretions which contain the infectious matter, and the contents of the vesicles are likewise not very infectious. The epidemic appearance of facial erysipelas, the increase of the disease observed in many places at certain seasons, can hardly be explained in any other way than by the exanthropic diffusion of the infectious matter; and the dependence of many hospital epidemics upon foci of bacteria, and their cessation after removal of the latter, has long been known.

In all, 42 personal cases of puerperal erysipelas, which are extremely interesting in many respects, are at my command. I divide them into those which developed before delivery (6) and those which developed during childbed (36). I again distinguish those appearing on the genitalia and neighboring parts (30) and those which appeared in other organs (12).

Of the six cases which developed during pregnancy, none was located on the external genitalia, but four appeared in the face and two on the legs. Two cases terminated fatally. A pregnant woman, who had lived in the same room with another puerperal case suffering from facial erysipelas, was attacked with facial erysipelas on the day after the other patient was attacked, and died undelivered, of very acute meningitis, on the third day. The second pregnant woman with facial erysipelas died of peritonitis eight days after delivery. In the other four cases the erysipelas spread somewhat after delivery, but only for a short time, and all recovered rapidly.

If we add to these six cases another series of six cases of facial erysipelas which developed during childbed, two of these six cases were delivered in rapid succession, and two even on the same day, at a time when a case of facial erysipelas was present in the house. But it is especially noteworthy that all the cases of facial erysipelas which developed during childbirth ran a favorable course. One of the patients maintained that she had acquired the disease by washing her face with water which had been fouled by placing her vaginal tube in it. In the twelve cases of this group there were only two deaths.

Thirty cases started from the genitalia, 28 from the vulva, and 2 from the breasts. All developed during childbed, and we may divide them into three groups.

First, those in which the erysipelas appeared without any affection of the genitalia, after feeling thoroughly well, and usually in the later days of childbed: four cases, all primiparæ, with two deaths.

In the second group we include the cases in which infectious symptoms appeared in the internal and external genitalia immediately after delivery, but the erysipelas, which started from the nates, did not develop until the second or third week: fifteen cases, with five deaths.

In many of these cases, infection with the erysipelas virus only during the course of the puerperium is, at least, not improbable, because, on the one hand, the outbreak of the erysipelas was so remote from parturition that we can hardly conceive of such a long period of incubation, and, on the other hand, frequent contact, during childbed, with the genital wounds was unavoidable, on account of the existing affection of the genitalia. Yet we must not forget the possibility that the erysipelas virus was, perhaps, deposited with the inoculated puerperal virus, but did not find the requisite soil, on account of the rapid development of the other puerperal infectious germs, or was first introduced in such extremely small amounts that its development was much slower than usual. At all events, the not inconsiderable difference in the mortality of these cases in comparison with all the others (33.3 : 50 per cent.) is, in a measure, striking, and favors the assumption that the quantity of virus introduced was not large in some cases.

Finally, in the third group we find inoculation of the puerperal and erysipelatous virus during parturition, rapid development of the erysipelas during the first week: ten cases, with five deaths.

With regard to the occurrence of our erysipelas cases according to the seasons, it appeared that the majority of cases occurred in March, the least number in September; the summer was favorable, the winter unfavorable. The curve does not agree at all with that of the endemic occurrence of erysipelas in general, but with that which puerperal infections present in this respect.

Furthermore, on comparing all severe puerperal cases with those of puerperal erysipelas, it appears that the larger the number of the former the greater is that of puerperal erysipelas; it increases with the former, from five to thirteen per cent.

As regards the day of outbreak of the erysipelas, in 43.3 per cent. the eruption appeared in the first week, in 40 per cent. in the second week, and in 16.6 per cent. in the third week.

Comparison of the day of death in puerperal erysipelas with that in puerperal infectious fevers in general reveals considerable differences. Of the latter there died—

In the first week.	Second week.	Third week.	Fourth week.	Fifth week.
24.8 per cent.	48.9 per cent.	12.7 per cent.	9 per cent.	1.5 per cent.

Of puerperal erysipelas:—

6.6 per cent.	33 per cent.	20 per cent.	40 per cent.	0.6 per cent.

Deaths from erysipelas, like the outbreak of the disease, usually occur later than in the ordinary puerperal infections.

With the exception of a case of meningitis, the causes of death in fourteen cases of puerperal erysipelas were: colpitis, endometritis, metrolymphangitis, parametritis, pleuritis and pneumonia.

The observations made confirm the statements of others that primiparæ are far more predisposed to erysipelas; they are attacked at least three times more frequently than multiparæ. In this respect, also, puerperal erysipelas resembles the other puerperal infectious fevers.

Puerperal women suffering from genital wounds, particularly when they have been sutured, are especially predisposed.

It is noticeable that the patients included very young and very old primiparæ.

The number of anomalies of labor among the patients was remarkably large.

A very noticeable feature, moreover, is the fact that among the living children born to the patients suffering from erysipelas, two presented skin diseases (one a slight erythema, the other an eruption on the nates, due to digestive disturbances), but not a single one of these children was attacked by erysipelas, although the majority of the patients nursed their children for a time, some even during the course of the erysipelas. Hence, if the mere contact of erysipelas patients, as in measles and scarlatina, or a sojourn in the rooms in which such patients lie, would effect the transmission of the erysipelas virus frequently or usually, it would be inexplicable that newborn children, in whom erysipelas around the umbilicus is a not infrequent affection, should remain so entirely free from erysipelas despite the intimate contact with their mothers who suffer from the disease. Congenital erysipelas of the newborn I have never seen.

Finally, I wish to call attention to one fact, which appears to me to be convincing in this regard. In the largest erysipelas epidemics which I witnessed (1880), in which thirteen women in childbed were attacked, with six deaths, and in which repeatedly two women were delivered on the same day (Nos. 202 and 204 on March 7th, and Nos. 305 and 307, on April 9th), and some of the others were present in the house during the illness of the former, not a single puerperal case was attacked by facial erysipelas; all suffered only from erysipelas which started from the genitalia. But inasmuch as the nose is greatly predisposed to erysipelatous disease, because small wounds are so apt to occur there, it is an extremely surprising fact that in an epidemic of erysipelas, lasting nearly a year, among more than one thousand puerperal women, facial erysipelas was not observed a single time. Frequent opportunities must have been afforded for the transmission of erysipelas cocci through the air. The fact that this did not happen makes this mode of infection very improbable.

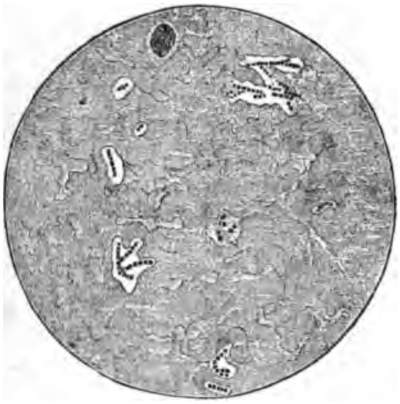
With regard to the question whether the erysipelas may also spread internally into the lymphatics of the vagina, uterus, pelvis, abdominal and thoracic organs, I find no reason to doubt this possibility, and among my cases are several which make this very probable. In the meantime, the demonstration of this form of disease has been positively made in a fatal case at our clinic (in 1886) by Docents Dr. Emmerich and Dr. Hartmann.

The bacteriological and microscopical examinations of the fluids and organs of this body, made by Hartmann, under the control of Emmerich and partly in my presence, gave the following results:—

From the lac-colored blood of the right breast of the body, which was in the first stages of rigor mortis, fine cultures of the Fehleisen erysipelas cocci were made by means of plate cultures and stab gelatin cultures, then taken off, under the microscope, from a heart's-blood plate and placed in bouillon. After the complete development of this bouillon pure culture, it was inoculated into the ear of a gray rabbit. At the end of sixteen hours the animal was attacked by very violent erysipelas of the ear, which spread rapidly to the root of the ear, back of the neck and scalp, and lasted a week. The ear was then cut off during chloroform narcosis. It paled rapidly; abundant, clear serum was discharged from the cut surface, and it presented no suppuration.

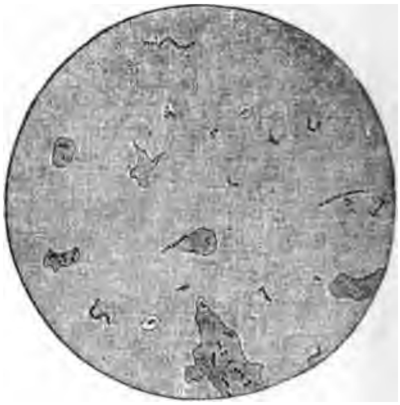
In the peritonitic and pleuritic exudation of this patient the erysipelas cocci were also found in perfect purity but in relatively much larger numbers, and those in the pleuritic exudation were much more abundant than in the abdominal exudation (*vide* Figs. 181 and 182).

FIG. 181.



Peritonitic Exudation. Puerperal Fever.
(F. Zeiss, Oc. III.)

FIG. 182.



Plumbic Exudation. Puerperal Fever.
(F. Zeiss, Oc. III.)

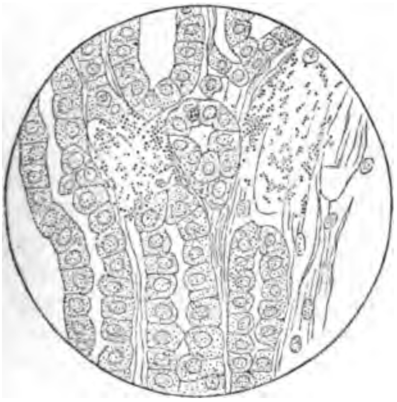
With regard to the organs themselves, it was found, on making plate cultures with all precautions, that the cocci developed in largest numbers upon the plates from the spleen, lungs and uterus. They were quite abundant upon the kidney, liver and heart-muscle plates. Putrefaction colonies were also present on some of the plates. The erysipelas colonies had developed in smallest numbers upon plates made of pieces of the cerebrum and cerebellum.

Microscopical examination of the tissue juices of the different organs showed double spheres as well as chains of micrococci, which exactly corresponded in size with erysipelas cocci.

The kidneys showed, on section, entire districts which were infiltrated with swarms of micrococci (*vide* Fig. 183). The vessels appeared entirely occluded by bacterial thrombi; the chain cocci also appeared in colony-like heaps in the interstitial connective tissue. The connective tissue around the cocci seemed loose and swollen, and was infiltrated in places with small cells. The connective tissue of the liver, in the neighborhood of the vessels (*vide* Fig. 184), was infiltrated in part with micrococci, in part with numerous small round cells. The cocci had also proliferated as delicate chains into the smaller ramifications of the hepatic vessels and into the dilated capillaries.

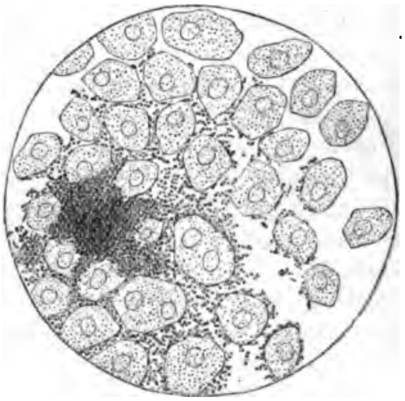
The spleen was infiltrated almost uniformly by the microörganisms. In the parenchyma the microbes were infiltrated (Fig. 185) in the shape of double globes and chains of six or more, and here and there were dense, larger balls of micrococci, which resolved themselves at the edges, in places, into a labyrinth of twisted chains.

FIG. 183.



Kidney. Erysipelas.
(F. Zeiss, Oc. III.)

FIG. 184.

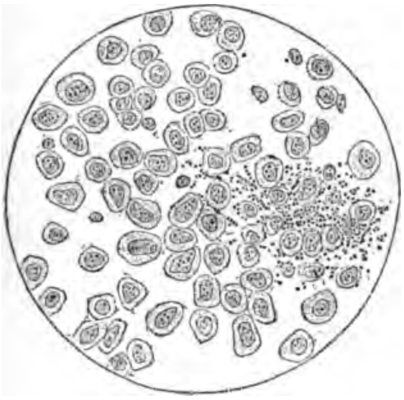


Liver. Puerperal Erysipelas.
(F. Zeiss, Oc. III.)

In the lungs the erysipelas micrococci were found not alone in the interstitial connective tissue (Fig. 186), in addition to small cell infiltration in more or less dense swarms, but also in the blood-vessels as thrombi, which usually did not plug the lumen completely. They were also found in the intermuscular connective tissue of the heart muscle, and around and within its blood-vessels.

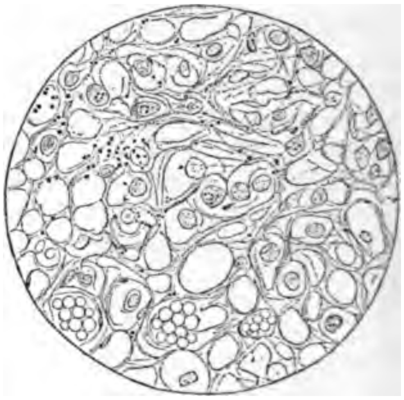
With the pure erysipelas cultures obtained from the fluids and organs of this body, Hartmann made a larger number of experiments on animals, partly in my presence and according to my directions; the virus was injected in part subcutaneously, in part into the abdominal cavity, in part into the walls of the abdominal organs. The results of these experiments may be summed up as follows: Elevations of temperature of 1–2° C. were found in the injected animals, together with swelling and redness of the skin, œdema of the mucous membranes, digestive disturbances, inflammatory processes in the intestinal tract, enlargement of the spleen, cloudy swelling of the liver; after injections into the pleural cavity, severe pulmonary processes, pleurisy, pericarditis, and purulent inflammation of the joints. That a considerable proliferation of the microbes occurred in the animals experimented upon, particularly in mice, may be inferred from the fact that the cocci were demonstrable in all organs, despite the small amounts injected. Apart from the mice, all of which suffered from fatal general infection after inoculation, no animal died, with the exception of one rabbit; but the infection was so much more severe in proportion to the quantity injected. Guinea pigs seemed to be even less sensitive to the virus than rabbits. Negative results were obtained in three experiments upon rabbits with injection of the erysipelas culture into the abdomen; only one rabbit exhibited slight swelling of the foot joint posteriorly on the right side. A fourth experiment on a rabbit was attended with positive results, and purulent peritonitis developed. Rats, guinea pigs and rabbits showed much less reaction than white mice. The latter died, after injection of the virus, in six hours to seven days, with the most severe general symptoms.

FIG. 185.



Erysipelas. Spleen.
(F. Zeiss, Oc. III.)

FIG. 186.



Erysipelas. Lung.
(F. Zeiss, Oc. III.)

Finally, in view of the possibility of inoculation of the erysipelas cocci in cauterization of wounds with liquor ferri sesquichloridi, Hartmann made experiments, at my suggestion, on the action of this remedy and alcohol upon the erysipelas microbes. These showed that alcohol inhibited but did not abolish their development, but that ten minutes', or even five minutes', action of liquor ferri sesquichloridi sufficed to rob the micrococci of their power of proliferation and to kill them, whether in dry air or in a moist condition. Hence, the transmission of erysipelas virus with undiluted liquor ferri sesquichloridi seems to be excluded. The result is different when the liquor is applied to wounds already infected. Then it kills the superficial bacteria and inhibits those situated somewhat more deeply, but the bacteria continue to proliferate under the crust which has been formed. The erysipelas of the injected animals, whose point of injection had then been brushed with the liquor ferri, did not make its appearance, as in the control animals, at the site of injection, but in a remote part, on the head. Moreover, it only developed three days after injection, was less severe, and had no material action on the general condition of the animal, while in the control mouse intense œdematous swelling, with redness, developed on the day after injection and caused severe sickness.

As the result of all these examinations I believe that in the erysipelas virus is indeed found one of the poisons of severe puerperal fever, so that the old doctrine of the causal connection of both diseases is correct in some cases. I desire to make a brief résumé of the proofs of this conclusion. The clinical proofs are: By far the most frequent starting points ($\frac{5}{7}$ of all cases) of puerperal erysipelas are the genitalia and nates. From here it usually extends, in 7–14 days, to the trunk, and then to the limbs and head, but there are also endemics in which not a single case of facial erysipelas occurs. Primiparæ are attacked by puerperal erysipelas 3–4 times as often as multiparæ. Lying-in women with wounds of the vulva are especially predisposed. Those who have passed through severe operative deliveries are attacked much more often than others. According to my experience, the children of lying-in women suffering from erysipelas always remain free from the disease, but among fourteen cases Gusserow observed it twice in children. The larger the number of severe cases in an endemic of puerperal fever the greater is the number of cases of erysipelas; it rises then from five to thirteen per cent.

The bacteriological proofs which may be adduced are: in one case of parametric exudation, which crept through the greater sciatic foramen, pus containing erysipelas cocci was extracted, before incision, by a suitably prepared Pravaz syringe. In addition, the characteristic erysipelas cocci were found in all the organs and fluids—particularly the blood—of a patient who had died of puerperal erysipelas. The gelatin stab and plate cultures always gave a positive result, and the growth of the cultured cocci corresponded exactly with those of Fehleisen. Finally, the proofs from experiments on animals are: with the pure cultures of erysipelas cocci obtained from the organs and fluids of women who had died, perfectly characteristic erysipelas was produced in the most various animals. Injections into parts of the body gave rise to inflammatory affections, suppurations of the joints, and intestinal affections. The cocci were again found in the blood and organs of animals so infected. As in the case of other bacteria, various animals react very differently to the erysipelas virus. It is most poisonous to white mice, but the affections of the fluids and organs produced hereby cannot be distinguished from those occurring in certain forms of puerperal fever.

From our experience it cannot be doubted that the erysipelas cocci may enter the lymphatics of the vulva, vagina, uterus and all internal organs, as they do those of the skin, and also that they produce a corresponding inflammation of all the organs, which finally terminates in death in many cases. It is very probable, as we have already remarked, that this disease may be associated with other forms of fatal puerperal fever, but also that it alone sometimes ends fatally. If all puerperal fever, for example, even that produced by the streptococcus pyogenes, is called puerperal sepsis, then internal puerperal erysipelas is also included necessarily in puerperal sepsis. But this term is less suitable because less clear, and it would be better to substitute the term bacterial infection or poisoning. Then erysipelatous poisoning would be regarded as one of these forms. The assumption that we had to deal, in our cases, with the streptococcus pyogenes, is disproven by the experiments on animals, because erysipelas was constantly produced by the pure cultures of the bacteria. However, it has been found that there may be different pathogenic cocci in erysipelas as in pneumonia. Further examinations on this point are therefore necessary.

Treatment.—At the present time I do not employ either carbolic acid injections under the skin, or brushing with carbolic acid (after Kaczorowski) which I formerly recommended. The latter is very painful on account of the resulting excoriations, and does not act as well as protracted (for weeks) lead water compresses or the ice bag. Internally, I give, in addition to antifebrine, carbolic acid in solution (0.5 to 175, a tablespoonful every two hours) until the pulse and temperature have returned to the normal. General lukewarm baths, and cold wet packs are also useful.

8. *The Etiology of Puerperal Fever, i.e., the Puerperal Mycosis.*

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Historical.—Hippocrates, in his books on epidemics, reported eight cases of puerperal disease concerning whose significance there can be no question. The term puerperal fever was first employed by Morton. According to Eisenmann's (1837) presentation of the different theories of childbed fever, the oldest hypothesis of the origin of the disease is that of lochial anomalies, advocated by Hippocrates, Galen, Avicenna, Mauriceau, Sydenham, Michaelis, De la Motte, etc. According to this theory, the lochiæ were suppressed by inflammation or spasm of the uterine vessels; poisonous substances were thus retained in the blood and gave rise to disease of the uterus, and then of all the organs; finally, a putrefactive fever developed.

Another series of authors explained puerperal fever as milk metastasis. Mercurialis is said to have been the first to suggest this notion, but Puzos (1753) first brought it into prominence. Borden, the predecessor of Broussais, stated that he had found real cheese and sour milk under the epidermis of the lying-in woman. In the "Ephemerid. Natur.," Decad. II, ann. 8, Observ. 167, p. 451, Rommel declared that he had made butter from the milk evacuated by the intestines. The chemist Hermbstaedt described the peritoneal exudation of a puerperal case as "real milk, saturated with volatile alkalies, from which the cheesy and buttery parts could be separated by the addition of acids." It is, therefore, hardly astonishing that, until very recent times, the laity should have a great dread of the "milk going to the head or other parts of the body."

Autenrieth's so-called physiological theory, advanced in the beginning of this century, maintains that, during pregnancy, the flow of the juices takes place chiefly to the inside, and especially to the uterus; after delivery they are again directed externally through the perspiration, lochia and lactation. If the performance of these peripheral functions is disturbed, the current seeks another focus in the head or chest, but most frequently in the abdomen.

According to the gastro-bilious theory, first advocated by Trincavellus, Cooper and Denman, Stoll and his pupils, these affections result mainly from an accumulation of biliary, mucous substances in the primæ viæ. This accumulation is brought about by the interference with the circulation in the intestines, resulting from pregnancy.

Other observers were convinced that inflammations were the chief element in puerperal fever. This phlogistic theory assumed partly a thoroughly isolated metritis (Plater, 1602), or a metritis with coincident affection of the adjacent organs. It is worthy of mention that in 1787 Clarke claimed to have found a purulent fluid in the uterine veins during an epidemic of puerperal fever. Meckel maintained that the disease always begins at the cervix uteri; in all pernicious cases small ulcers are found there, with a whitish-yellow, purulent base and plastic, fibrinous coating, which develop into these malignant forms by the action of changed lochia upon fissures after parturition. The inflammation of the lymphatics starts from these ulcers. Metritis, puerperal ulcers of the uterus and lymphangitis are found as essential factors in the puerperal fevers of all times and places; peritonitis, inflammation of the joints and phlebitis are subsidiary phenomena (1854). Other writers claimed that an inflammation of the intestines and mesentery is the cause of puerperal fever, inasmuch as these parts suffered passive hyperæmia, even partial paralysis, from the pressure of the pregnant uterus, or became hyperæmic and inflamed soon after parturition on account of the strong congestion (Denham). In 1779 Johnstone published W. Hunter's opinion that peritonitis is the real locus morbi in all forms of puerperal fever.

The phlogistic theory is allied to the erysipelatous theory, which was first advanced in 1766 by Pouteau. De la Roche believed that these fevers were due to an erysipelatous inflammation of the intestines. Gordon (1795) believed that an erysipelas of the peritoneum, and Ozanam that an erysipelatous inflammation of the entire uterine system and its appendages, were the basis of the symptoms. It was emphasized that, at the time when epidemics of puerperal fever occurred, erysipelas also appeared in the same localities in non-puerperal women, and that the nurses of the diseased lying-in women suffered not infrequently from erysipelas of the arms and hands. But, as Hirsch has shown in detail, the morbid entity known as erysipelas by the English constitutes a much wider conception than our simple erysipelas, because they include under this term all phlegmonous processes in the skin. English physicians still adhere, in part, to the identity of puerperal fever and erysipelas, and many Americans share this view.

Sennert, Willis and Whyte called puerperal fever a putrefactive fever or typhoid; in 1831 Cruveilhier also called it puerperal typhoid fever. Others considered it identical with hospital typhus.

Wedel, Punch and Cederschjoeld maintained the opinion that every puerperal fever is an intermittent fever with a different type.

The hypotheses hitherto referred to have usually started from the assumption that so-called puerperal fever is, in the main, one form and species of disease. But the opinion gradually was developed that these diseases are of various kinds. This view was based on Stoll's statement: "Nulla febris est, quæ non aliquando cadat in puerperam." Schu, Helm, Mueller, Trousseau and Brouillaud denied that there is anything characteristic about so-called puerperal fever, and showed, in particular, that all these affections are also found in pregnant or non-puerperal women, in the new-born and in men; that they are due to a specific something, to a common cause, but that its nature is unknown.

According to the hæmatogenous theory, whose advocates are to be found, in part, in the adherents of lochial and milk metastases, the nature of severe puerperal diseases depends on a primary specific alteration of the blood. This blood-change results from a miasm, an unknown something, and either produces local morbid changes or proves fatal by its action on the nerve-centres (*Litzmann, Scanzoni, Bamberger, Veit* (formerly), *Depaul, Paul Dubois*).

Finally, Semmelweis appeared, in 1847, with the statement that cadaveric poison is the immediate cause of puerperal fever, and in 1861, when his well-known work, "Die Aetiologie, der Begriff und die Prophylaxis, etc.," appeared, stated that every case of puerperal fever is an absorptive fever, due to the absorption of a decomposing animal organic matter. The latter may reach the individuals by infection from without or by the reception of decomposing substances in their own body (self-infection). Thus, so-called puerperal fever may be produced by corpses of any age or sex when they are decomposed, also by patients of any age or sex whose disease is attended by the production (externally) of a decomposing animal organic matter, and finally, by all physiological animal organic structures which have reached a certain grade of decomposition.

Data.—It is now generally recognized that none of the processes described in No. 1–7 has any characteristic peculiar to childbed alone, and is found not only in pregnant, parturient and lying-in women, but also in non-pregnant women, new-born children, and in men.

Isolated cases of so-called septic puerperal disease occur everywhere, in hospitals as well as in private practice, among the poor and the rich, in the most varied constitutions and at all ages.

The starting-point of these diseases is always located in the genitalia themselves, from which the general disease takes its origin. Visible wounds of the genitalia are not necessary for their development. In the same way that phlegmons of the limbs occur with entirely intact integument, the analogous affections of the uterus and vagina may also develop without previous wounds (vide Hausmann's experiments on animals). But this does not imply that every affection of this kind before the beginning of labor can be explained only in this way, because no wound is present before delivery, for we know that erosions and ulcerations of the portio vaginalis are found in unusual frequency in more than 80 per cent. of pregnant women, and that infection from these wounds may take place during pregnancy as well as during labor.

The local affection becomes general, either because the process extends along the connective tissue, or virulent fluids or low organisms are transported in the fluids of the body to all the organs, or individual infected foreign bodies are carried in the circulation, deposited in remote organs, and there produce disease. Combinations of these different modes of extension of the original process occur in manifold ways.

Wounds and contusions of the external and internal genitalia often form the starting-point for such inflammations. We observe them particularly after protracted difficult labors, whether terminated artificially or not, especially when the injuries have been so severe that they have been followed by gangrene of certain parts.

Decomposition of retained fragments of the membranes and placenta within the uterus may produce septic puerperal diseases.

Blennorrhœas of the genitalia may become aggravated, during childbed, into acute parenchymatous inflammations, and so much more readily because they induce premature rupture of the membranes, and thus delayed labor and greater irritation of the inflamed genitalia by the fœtal parts, especially in primiparæ. Under the influence of the infected secretion ulcers form from the injuries to the mucous membrane, which, being maintained by the still existing inflammation, become the starting-point of phlegmonous diseases.

It is also beyond question that the most severe puerperal diseases may be produced by infection of wounded parts of the genitalia with cadaveric substances, and with the secretion of ichorous, gangrenous wounds.

As a matter of course, not all dead bodies and not every wound exert such an injurious influence. It is also undoubted that not every one will be affected with equal readiness and severity by such substances, and that some may remain entirely free from infection despite frequent contact. But the fact that lying-in women are especially predisposed to such infections is explained sufficiently by the almost constant presence of small, numerous injuries of the genitalia, the abundance of blood in the vulva, vagina and cervix during and immediately after delivery, and by the peculiar circulatory conditions in puerperal women.

Compared with the frequency of all these causes, severe puerperal affections seem to be rare in private practice. But even in private dwellings numerous endemics have been observed by many writers. At the same time maternity hospitals will always appear more unfavorable than private houses in regard to the mortality of lying-in women from these and other diseases. The explanation of this fact is evident. There are many more primiparæ in maternity hospitals than in private houses, and many of the inmates enter when already diseased; they suffer particularly from infectious catarrhs (gonorrhœa) and syphilis, which diminish their powers of resistance. In addition, confinements in private practice, as a rule, are much more remote from one another in time than is usually the case in lying-in wards. Destruction of the virus is therefore much easier in the former, and direct transmission is more rarely possible. The probability of infection is also lessened because examinations are made less frequently in parturitions in private practice, and finally, the physician in private practice comes much more rarely in contact with autopsies or gangrenous wounds than do students of medicine.

The conditions of the soil are entirely irrelevant as regards the occurrence of severe puerperal infection; it occurs on high and low, dry and damp localities, upon the seacoast and in the interior (*Hirsch*).

The epidemics begin and prevail most frequently in the winter, then in the spring, autumn and summer, in the order mentioned, although meteorological conditions exercise no demonstrable influence.

In large cities which contain several maternity hospitals, it has often been found that a very good condition of health prevailed in one, while a frightful endemic prevailed in the other, and not alone when the hospitals were situated at a great distance from one another, but even when they were located under the same roof.

In very many cases of murderous endemics in lying-in-hospitals, the city population enjoyed an excellent condition of health.

Prolonged stay in a maternity hospital prior to parturition by no means predisposes to severe disease.

The constitution of pregnant women has no influence whatever upon the liability to disease, and the strongest are attacked as often as the weakest.

Individuals who are received in maternity hospitals after delivery (after street labors) show the relatively most favorable condition of health, even if placed among cases of puerperal disease.

The overcrowding of maternity hospitals is by no means always dangerous to the health of the lying-in women, but the morbidity is increased, in general, only by overcrowding in small hospitals.

In the epidemic spread of puerperal fever outside of hospitals, the greatest number of cases are confined, as a rule, to the practice of one physician or midwife, and hence the disease is usually limited, even in the larger cities, to small districts.

The carriers of these infectious matters are the fingers of the examining physician, the instruments used for injections, and the utensils and articles (bed-pan, sponges, linen, pillows) used by the parturient woman. Inasmuch as the examinations, injections and use of such utensils usually occur before, during and immediately after parturition with such frequency and duration that infection may occur, this explains the fact that the majority of cases of disease date from this period, especially from the termination of confinement. "The morbific agent is situated in the hospital, in the room in which delivery takes place" (*Spaeth*).

The transmission of the disease through the air of hospitals is not yet proven, and, if it really occurs, is extremely rare. For the cases in which such a probability is presented, we may not assume the reception of the virus by the lungs and its deposit in the uterus, but only its direct action upon some part of the genital mucous membrane. Air that is strongly contami-

[illegible]

[illegible] able to counteract permanently [illegible] puerperal diseases in large maternity hospitals. The favorable results [illegible] to have been due to arrangements for ventilation cannot be ascribed [illegible] because [illegible] depend [illegible]. Hence, ventilation is not the sole or most important means of prevention. Only one of the above-mentioned facts may appear to favor the doctrine of the more frequent transmission of infection through the atmosphere, viz., the observation that epidemics occur most frequently in winter. But the probability of the transmission of infectious substances is greater in winter than in other seasons, because, as a rule, much greater opportunity is afforded to take part in autopsies; because the majority of births usually fall in this season; hence, particularly in small institutions, the interval between the individual confinements is shorter and more parturient women are examined in rapid succession; because the zeal of the students and assistants is usually greater than at the end of the semester (spring and summer), when nature draws them away from such sedentary studies: and because, finally, the thorough repeated cleansing of the hands by the midwife, pupils and students is much more apt to be neglected in winter, especially when the water is cold, than in the summer. Moreover, erysipelas, phlegmons, catarrhs, rheumatism and endometrits, perimetritis and peritonitis, are much more frequent in winter. Finally, it has been demonstrated that in winter there are, on the average, more frequent abortions, anomalies of labor pains, and hence protracted labors, and the injurious influence of the latter is admitted by all writers.

The theory that the atmosphere is almost harmless in the transmission of the virus to parturient women, is also favored by the fact that diseases of the respiratory organs occur secondarily, without exception, in severe puerperal fevers and are not found primarily. Thus, pharyngeal diphtheria is so rare that I have seen it only once among nearly 17,000 puerperal women. But, according to my experience, the most weighty proof of the innocuousness of the air for parturient and puerperal women is the experiment (performed by me very often during the past twenty-five years) that, when cases of infection appear, the endemic can be extinguished in a few days by the exclusion of the midwives and physicians engaged in the examinations, without any other change in the maternity ward, the instruments, beds, etc. The same ward, the same room, the same bed, the same atmosphere, merely the entire cessation of examinations, with the exception of those absolutely necessary, made by a non-infected midwife under strict supervision. How can the striking result of such an experiment, which can best be made in very large institutions, be explained otherwise than on the theory that the examination of the parturient women, especially that with the finger, almost always produces the infection, that the virus is a fixed one, that the introitus vulvæ and cervical canal are the sites of infection, but that the atmosphere surrounding the puerperal woman plays only a very subordinate part?

Some writers, among them Fenton, believe that they have observed the transmission of puerperal fever by the linen which women's associations have loaned to different lying-in women in succession. There is another series of writers who assume the transmission of the contagion in the clothes of the physician or midwife. This is true of those who believe in indirect transmission through the atmosphere as well as in direct transmission from contact with abraded surfaces. But although the latter may certainly occur, the former is by no means proven. Huntley, who had the misfortune to infect a series of lying-in women, despite frequent baths and changes of clothing, abandoned his practice for six weeks, yet the next two or three women delivered by him were also attacked, so that he was again compelled to abandon practice for some time. Huntley believes that the theory of infection by means of the physician's clothing is not tenable; and that it is hardly credible that the infection could be conveyed by means of the surface of the skin at the end of several weeks, despite frequent washing and bathing. I have had the same experience with various hospital internes. In all cases in which the obstetrician has touched the parturient woman, apart from his clothing, with his fingers or instruments, and has repeatedly examined her genitalia, we must regard the latter as the carriers of infection, because the clothes rarely come in contact with abraded parts, and would usually touch them, if at all, only temporarily and not for a long time, and finally, because they are hardly ever so impregnated with infectious matters, as often happens with regard to the hands. But if it is objected that disease may ensue despite the careful cleaning and disinfection of the hands with chlorinated water or permanganate of potassium, or carbolic acid, we must contend that such washings, repeated once or even several times, are by no means always sufficient; that even after numerous cleansings the hands may still smell, so that we must infer the presence of odoriferous substances on the fingers. The washings do not lose their value on this account, and must always be carried out, but their action is only positively certain when they are repeated until all odor has disappeared from the hands. Hence it is very excellent advice that obstetricians with a large practice should never perform autopsies, despite these washings, or at least should not take charge of a confinement for several days afterward, even despite the most careful measures of disinfection.

The question as to the *character of the virus* which produces the severe puerperal diseases coincides with that of the causes of suppurating phlegmons and abscesses, and has been cleared up materially in recent times. A few years ago the opinion prevailed generally that these diseases were produced solely by microörganisms. But it has been shown beyond a doubt by Orthmann's investigations, and then by Passet, Brewing, Grawitz, de Bary, Kreibohm and Rosenbach, that suppurations and abscesses may be produced promptly by chemical substances, without microörganisms. We also know that even in those suppurations which are due to microörganisms, the direct action upon the tissue elements must be ascribed to the chemical substances —the ptomaïnes.

It is of special interest that suppuration is also excited by cadaverin, a substance which can be produced not alone by bacterial action, but also by purely chemical means (Rosenbach: *Beilage zum Centralblatt fuer Chirurgie*, Nr. 24, 1888. "Address before the 12th German Surgical Congress"). Putrescin (*Brieger*) is also said to possess similar properties. However, the substances which, in addition to the presence of microbes capable of proliferation, prove their virulence, are little known as yet, and it will need long and laborious investigations in order to recognize accurately these surely very numerous chemical agents.

We have already described accurately and depicted (*vide* pages 832–840) the *microbes* which have been demonstrated heretofore as pathogenic organisms in all cases of suppuration, and have also been found in infected lying-in women in the lochia and tissues of the sexual organs; their vital characteristics are also known in a measure.

1. Streptococcus erysipelatis.—Closely related to it, but much more dangerous is—

2. The streptococcus pyogenes, a chain-forming micrococcus, which gives rise to redness, swelling, rapidly spreading superficial inflammation, which passes relatively late into suppuration. It is very apt to occur secondarily in other infectious diseases, passes early into the circulation, penetrates the lymphatics and blood-vessels, and proliferates throughout the tissues in the shape of dense bands and colonies. According to Hartmann's investigations in our clinic and Doederlein's in Leipzig, these cocci have been found, almost without exception, in the sexual organs of sick puerperal women, so that they must be regarded as the specific wound-infection germs in the majority of cases of puerperal fever.

3. The staphylococcus pyogenes aureus, discovered in 1883, by Becker, in acute purulent osteomyelitis. It owes its name to the grape shape in which the dense, round cocci are arranged and the production of an orange-yellow coloring matter. In addition to the saliva, pus and pharyngeal secretion, it is also found in the atmosphere, and retains its vitality in cultures for one to two years. It has also been found in the lochia of puerperal women with slight fever, and cultures have been made. It has a tendency to produce a more circumscribed inflammation which suppurates more rapidly than that produced by streptococcus pyogenes. Hence, it is found with special constancy in puerperal lobular mastitis.

4. Staphylococcus pyogenes albus also occurs in puerperal conditions of the sexual organs; it grows upon the nutrient substances with a whitish color, is rarer than staphylococcus pyogenes aureus and probably less pathogenic.

5. The gonococci discovered in 1879 by Neisser are also to be regarded as the cause of certain severe puerperal affections, especially purulent endometritis and salpingitis with secondary peritonitis. Usually arranged in pairs and forming heaps within pus or epithelial cells, they become mutually flattened ; they are set free after the destruction of the cells.

6. According to Bumm, a very similar coccus is the cause of puerperal catarrh of the bladder.

There are surely many pathogenic cocci in the sexual organs of the female still undiscovered, in the same way that even now we do not possess full knowledge of the different forms of putrefaction bacteria. But, as we have already stated, their discovery is not sufficient; we must also ascertain the character of the virus produced by them (*vide* pages 873 and 899 : tetanin). Whether cocci in the female sexual organs, and if so, which ones, prepare for the action of other pathogenic microbes, or whether certain kinds are able to kill the especially dangerous cocci, remains to be investigated. Both possibilities possess a certain degree of probability.

It is not our purpose here to enter upon the means which the organism has at its command to combat such injurious influences. It need only be mentioned that the white blood globules at first do not absorb poisonous cocci, but only enfeebled ones, the former being ingested at a later period; they gradually become accustomed to stronger poisons and are then able to digest them. This may partly explain the fact that multiparæ are attacked much less frequently than primiparæ, because they have attained a certain immunity.

The question of so-called self-infection must also be considered. While it has been positively ascertained that the lochia of the vagina, under normal conditions, contain innumerable germs of the most different varieties, the normal uterine lochia contain no germs and may be injected into the body of an animal, in any amount, without injury. As a general thing, the vaginal germs do not enter the puerperal uterus. But during parturition the cocci situated in the vagina may make their way into the uterus partly by creeping along in the fluid which covers the internal genitalia, partly by direct aspiration (*Kaltenbach*). When cocci are pushed into the uterus by an aseptic injection tube, this cannot be called self-infection, because the instrument alone produced the infection. If parturient women are delivered without examination, they often, it is true, show slight fever, œdemas and irregularities in the involution of the uterus, especially when they have been delivered out of bed, but they do not die from such slight infections. In many of these individuals we have no right to speak of self-infection, so long as we cannot positively exclude the presence of gonococci in the cervical secretion. Even this does not prove that infection has not occurred from the outside, because in gonorrhœal endometritis as well as conjunctivitis there is a stage in which cocci can hardly be found and yet the secretion is still infectious (*Fraenkel*, *Steinschneider*).

Retained fragments of the membranes and placenta often cause fever, but I have seen no case in which such patients died, unless they had been examined or treated with injections or the catheter.

Without denying, as was formerly done, the occurrence of self-infection, I must, nevertheless, regard it, according to my experience, as a very rare exception. But, like the belief in miasm, it relieves the conscience, and will therefore always retain a considerable number of adherents.[*]

The question of the tenacity of puerperal wound viruses must finally be considered briefly in regard to the abstinence from practice of infected obstetricians.

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[*] LITERATURE.—Ahlfeld, F.: "Berichte und Arbeiten aus Marburg," 1885, II, 146. Barth, L.: "Die Präexistenz von Mikroorganismen im Blut mit Berücksichtigung eines seltenen Falles von acuter puerperaler Sepsis," *Würzburger Monatsschrift*, 1882. Davis, L. N.: *Med. and Surg. Reporter*, Philad., 1885, LII, 198. Fisher: *Wratsch*, St. Petersburg, 1886, VII, 625. Kaltenbach: "Volkmann's Sammlung klin. Vorträge," 1887, Nr. 295. Landau: *Archiv f. Gynäk.*, 1884, XXIII, 293. Reynolds: *Lancet*, London, 1884, II, 542. Rosolino, F. F.: "Flemmone autoctone della fossa iliaca in donna puerpera," Palermo, 1886.

There is still considerable divergence of opinion on this point. My experience has been communicated partly in my "Reports and Studies," I and III, pp. 439 and 440, partly in the publications of Dr. Graebner (*St. Petersburg Med. Wochenschrift*, 1882, Nos. 51 and 52). These were subsequently confirmed in Erlangen, and upon their basis Dr. von Swiecicki* demands eight days' abstinence. Loehlein regards this as very doubtful without positive measures of disinfection, and also as entirely impracticable. Wiener believes that, if antisepsis is of any benefit whatever, we must require that it will, in a short time, so thoroughly disinfect one who has come in contact with infectious substances that he may at once accept the care of confinements. As a proof of the correctness of this opinion he refers to the experience of Ahlfeld and Volkmann and the results of the Breslau Clinic from 1880–1882. But when he says that only 1.06 per cent. of cases of infection occurred among 471 parturients in those years, he now knows that these figures are about four times as high as they should be. His other views have already met with sufficient refutation at the hands of Hofmeier (*Centralblatt f. Gynäkol.*, 1883, p. 425). Although the conditions may have improved under antisepsis with corrosive sublimate, Fritsch (*Centralblatt f. Gynäkol.*, VII, p. 431) also calls attention to this. Yet, despite the five years' use of sublimate in the Munich Clinic, I am still in favor of abstinence, and agree entirely with the conclusions of Góth, both in regard to the use of the aseptic hand and to the differences in the duration of the period of abstinence. In controlled, strict disinfection, abstinence may be limited to three to four days. When this is not possible, it should last not less than eight days, according to the experience of Huntley, Swiecicki and the writer.

At all events, a considerable diminution in the morbidity and mortality of puerperal women has been secured in Saxony and Bavaria, by the exclusion of infected midwives. The exclusion acts not alone upon those midwives whose patients have been very sick or have died, but acts at least as powerfully on all others, inasmuch as it makes clear to them the injury they will suffer in position, reputation and income, from the careless attention to antisepsis. Above all, it must be remembered that such regulations must be carried out, not alone for good and very good midwives (although they, also, may meet with unfortunate cases), but chiefly for the large number of unreliable, careless and unclean midwives, upon whom the necessity of antisepsis can be impressed as little by friendly admonition and warning as the danger of the abuse of alcohol can be impressed upon the sot, or that of morphine upon the morphine-eater.

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* LITERATURE—French: *J. Amer. M. Ass.*, Chicago, 1885, v, 5–8. Göth: *Centralblatt f. Gynäkologie*, 1883, VII, 490. Löhlein: *Centralblatt f. Gynäkol.*, Leipzig, 1883, VII, 361. von Swiecicki: *Centralblatt f. Gynäkologie*, Leipzig, 1883, VII, 249. Meisburger: *Med. Correspondenzblatt für deutsch-amerikan. Aerzte*, Buffalo, 1883, I, Nr. 11, 1–10. Wiener: *Centralblatt f. Gynäkologie*, Leipzig, 1883, VII, 377.

Finally, we will consider, in a few words, the efficacy of vigorous antisepsis in clinics and private houses. Credé's treatise on healthy and sick lying-in women furnishes so much more cause for such discussion, because his propositions tend to the greatest possible abstinence of students and physicians from the examination of parturients, and especially from the exploration of lying-in women who are already sick. On the other hand, the writer is of the opinion that so long as an exploration may be made innocuous, and is performed gently and not with unnecessary frequency, it may and should be performed; but when a puerperal woman is diseased, the physician must ascertain, by the most careful examination possible, the site of the disease, and must destroy it. According to Credé's method, in which the genitalia are not touched, this is impossible; in many cases we then remain in the dark. But, inasmuch as Credé relies upon his results with this treatment, the writer has collated his own and compared the two. This shows—

	In Munich, 1883–86.	In Leipzig, 1883–85.
Mortality from infection, ...	0.48 per cent.	0.43 per cent.
Mortality from other causes, ...	0.39 per cent.	0.50 per cent.
Total mortality, ...	0.87 per cent.	0.93 per cent.

From this it may be inferred that "many roads lead to Rome," and that at least the same results are obtained by our method. Hence there is no reason for discarding it as dangerous.

In the mean time, it has been ascertained by the work of Dr. Zahn ("Die puerperalen Todesfaelle der Muenchener Frauenklinik von 1883–87," *Münch. med. Wschr.*, 1888) that, among 3057 parturients in Munich in these four years, only 0.26 per cent. died of puerperal infection, *i. e.*, much less than with Credé's method. Hence we prefer our plan of treatment, although it is more inconvenient for patient and physician.

In various places ("Berichte," Vol. II and III), we have shown in detail that the sanitary condition of lying-in women in private houses must be better in many respects than in obstetrical clinics and colleges for midwives. Hence we do not go too far in requiring that the mortality from puerperal infection in clinics and private houses must be restricted to 0.25 per cent. by vigorous antiseptic methods, and that—as we have shown in another place—the puerperal morbidity, *i. e.*, the occurrence of only a single rise of temperature above 100.75° F., must be diminished to 15–20 per cent. of the entire number of lying-in women.

The tables collated by Dohrn show how far removed the German clinics were from these requirements at a not distant period. How much more these figures are exceeded in other countries is shown by Hirst's tables, according to which, among 19,902 women delivered in maternity hospitals in the United States from 1880–1885, 516 or 2.59 per cent. died. At the same time some institutions in Baltimore, Brooklyn, Chicago, Cleveland, Cincinnati, Louisville, New York, Philadelphia, Rochester and Washington had a general mortality of only 0.33–0.86 per cent.

May all maternity hospitals soon show equally favorable conditions as regards the health of their inmates.

SECTION II.

Puerperal Diseases of the Female Breasts.

CHAPTER I.

Diseases of the Nipples.

LITERATURE.

Barker, Fordyce: "A Clinical Lecture upon Sore Nipples and Mammary Abscesses," *New York Med. Record*, Sept. 15, 1873. Berger: *Pester med. Presse*, 1884, xx, 465. Bouchut: *Gaz. des hôpitaux*, No. 34, 35, 1854, p. 135 and 138. Bourdel: *Gaz. des hôp.*, No. 121, 1854, p. 483. Haussmann, D.: "Bedeutung wunder Brustwarzen," *Centralbl. f. Gynäk.*, 1883, vii, 121. Hebra: "Handbuch der Pathol. und Therapie," 1860, Hautkrankheiten, p. 357. v. Hübner: *Deutsche Zeitschr. f. prakt. Medicin*, von C. Kunze, 1875, No. 21 and 22. Kaltenbach: *Centralblatt für Gynäkologie*, vii, 65, 1883. Kehrer: "Die erste Kindernahrung. Sammlung klinischer Vorträge von Volkmann," No. 70. Idem. *Prakt. Arzt*, Wetzlar, 1883, xxiv, 49. Scharlau: *Berliner klinische Wochenschrift*, Vol. i, p. 191, 197, 1864. Schramm, J.: "Scanzoni's Beiträge." Vol. v. p. 25. Velpeau: "Traité des maladies du sein," etc., *Monatsschrift f. Geburstkunde und Frauenkrankheiten*, xi, p. 153. Vérette: "Des gerçures du sein." Thèse de Strasbourg, 1865, p. 15–37. Winckel, F.: *Monatsschrift für Geburstkunde*, xxiv, 345, *Berliner klinische Wochenschrift*, Vol. i, p. 21.

Inflammations of the nipples may appear as *erythema papillarum;* the skin is slightly reddened, the cutis not infiltrated: or as a *phlegmon;* the nipple is greatly swollen, the integument dark-red; the swelling usually extends to the areola: or as *eczema rhagades papillarum;* at first small, round vesicles as large as a millet-seed, 3–8 on a nipple, usually upon both nipples, and filled with clear serum; if a vessel bursts, the epidermis is again applied to the underlying skin or it is detached, the reddened corium is exposed and bleeds occasionally. An ulcer often develops from the erosion. *Fissures and ulcers* are situated either at the tip or base of the nipple; they are semilunar and narrow at the base, broader and deeper at the tip. *Ecchymoses and hemorrhages* appear in the shape of small linear or round extravasations at the top of the nipples, corresponding to the parts which have remained free between the infant's jaws. According to Bouchut the fissures at the base and tip of the nipple develop into ulcers which connect several lacteal ducts with one another and form a crater-shaped opening into whose base the milk ducts open. These ulcers may heal, a few milk ducts obliterate, but gradually all may become impermeable; atrophy of the breast then follows. *Herpes areolæ papillæ* is a chronic, very obstinate eczema, associated with pronounced formation of crusts, which does not extend beyond the areola but covers it and the nipple uniformly with thick yellow crusts. When the brownish or yellow crusts are exfoliated, they often tear, and fluid trickles out between them.

These diseases of the nipples are accompanied by pains in the breast and toward the axilla on putting the child to the breast; fever is occasionally present. Simple eczema vesicles, erythema and slight fissures are unattended with marked elevation of temperature, while ulcers are associated not infrequently with high fever. Corresponding to the action of the irritation, this fever exhibits different types. It is often most severe in the morning when the child has nursed a good deal at night from the diseased breast. Exacerbations to 104° F., or more sometimes, occur at noon, but usually at night. Rapid defervescence is occasionally produced at the height of the fever by suddenly weaning the child. But, as Kaltenbach has correctly shown, the fever is usually only the result of infection of the fissures.

On account of the pain and fever the appetite is lost, rest at night is disturbed, the patient becomes excited and anxious, and shrinks at the thought of putting the child to the breast. Delicate individuals grow so irritable from painful raw nipples that they cry out aloud when the raw place is first grasped and almost go into convulsions from the pain. They are often exhausted and depressed in a few days. The rhagades usually heal completely in 10–12 days. In a few cases nodules develop in the breast, and a glandular abscess then forms after awhile. In others the inflammation of the mamma only appears 8–14 days after complete cicatrization of the wound in the nipple, but is attributable to the latter, because it corresponds exactly to its situation. Before the nodules appear, some women continue to suffer pain on nursing the child, despite the healing of the fissures. Ulcers of the nipple, which last a long time, occasionally destroy the greater part of the breast, so that it becomes permanently useless for nursing.

Etiology.—The liability of the nipples to become diseased is usually so great because the women often neglect them during pregnancy. The pressure of faulty clothing, which interferes with the development of the nipples, is injurious. In addition, the colostrum, which dries after trickling out, often forms a thick crust upon the nipple. Under this crust the epidermis is very delicate and soft, so that it is very easily macerated and detached by the buccal fluids of the nursling. As a general thing this has an acid reaction for several weeks after the end of the first day, and is thus especially adapted to produce erosions of the nipple. They are found in multiparæ as often as in primiparæ; thin skin and imperfectly formed nipples are special predisposing factors. They occur most frequently in the second to fifth days, and are found usually on both nipples. In some women they recur with each period of lactation, despite every precaution. Rossi believes that inflammations and ulcerations in the child's mouth are the usual cause of the excoriations, but it must be remembered that the latter usually appear much earlier, and very often without any trace of a buccal affection on the part of the child. If the latter is found, it is probably the effect rather than the cause of the affection of the nipple in the mother.

In the majority of cases, vigorous nursing, traction and pinching or biting by the child's jaws is the main factor, especially when the jaws do not grasp the nipple easily, because it is too small or flat, or when the nipple, on account of faulty position, cannot be conveniently encircled by the lips, or finally, when the secretion of milk is deficient and the efforts at nursing are very vigorous. Bouchut calls attention to the artificial drawing forth of the nipple by means of cups, to the pressure of the corsets, to the squeezing of the nipples into bottles in order to collect the milk. From a *prognostic* standpoint it is noteworthy that mastitis incipiens develops in 18 per cent. of diseases of the nipples, but that only 4 per cent. of these inflammations undergo suppuration.

Treatment.—In order to prevent rhagades, pregnant women should wear comfortable clothing, which does not compress the breasts; must begin early to wash the nipples. Small, flat nipples must be drawn out with the fingers; must be fixed into position, according to circumstances, with a rubber ring, and must be hardened more and more by astringent and spirituous lotions.

It has long been known that rhagades often resist all treatment. In simple erythema and phlegmons, compresses of lead-water should be applied, and the nipples carefully cleaned before the child is put to the breast. In erosions, vesicles and excoriations of a more severe form, compresses of a 3–5 per cent. solution of carbolic acid are made. Ulcers are treated with balsam of Peru or copaiba and covered with compresses of lead-water, in order to relieve the inflammation of surrounding parts. The child should not nurse directly, but through a rubber nipple shield. If the sore spot persists despite all our measures, if the ulcer extends superficially and deeply, if the patient suffers from fever and the gland begins to be painful, the child must be weaned. In general, it should be put to sore nipples less often than to healthy ones, and the child's mouth should be cleansed with special care after nursing. In many cases, the frequent use of ice-cold linen compresses relieves the painfulness of the nipple. If the child is weaned, even the most severe excoriations usually heal spontaneously in a few days.

The most obstinate form is eczema of the areola. The measures recommended—such as fresh zinc salve with or without oil of cade, tannin with ung. glycerini, solutions of nitrate of silver and potash—all act uncertainly. Despite prolonged treatment with such remedies, I have seen several cases of eczema persist obstinately, not alone during pregnancy but also in childbed. In my last case it persisted through the second pregnancy, and even after the second childbed.

In obstinate eczema of the nipples, Hebra used cauterizations with solutions of corrosive sublimate (1 : 90) or caustic potash (1 : 2).

CHAPTER II.

The Diseases of the Integument of the Mamma and the Perimammary Connective Tissue. Perimastitis.

Inflammation of the glands of the areola gives rise to a few nodules, with infiltration of surrounding parts and redness of the skin. After some time a plug of pus appears at the top of the nodules, perforates the skin in one or more places, and, after its evacuation, leaves an ulcer. The treatment of these inflammations consists of impervious protective coverings (empl. saponat.), evacuation of the pus by a small incision, removal of the plug. If ulcers are left over, plaster with collodion covering is applied as a protection against the child. The disease can be relieved in eight to twelve days.

In *erysipelas of the breast* the redness is intense and diffuse, and associated with burning, sticking pains. Usually, only one breast, occasionally both are attacked; more often, one after the other. The erysipelas either recovers after desquamation of the epidermis, or vesicles form, burst, and leave crusts behind. It sometimes passes into a phlegmon, the skin appearing of a dark bluish-red, very tense, smooth and shining, and diffusely swollen; here and there it exhibits œdema. This phlegmonous inflammation usually leads quickly to suppuration, and recovery takes place with the evacuation of the pus. In rare cases of phlegmon of the mammary integument, the lymphatic vessels are seen passing to the axilla as red bands, which are painful on pressure. The axillary glands are then swollen and painful.

Chilly sensations or a severe chill, followed by a hot feeling and perspiration, severe, sticking, burning, boring pains, with diffuse swelling and more or less uniform redness of the mammary integument, are observed at the onset. In erysipelas the disease lasts 8–10–14 days; in phlegmon, several weeks.

Treatment.—Dry warmth in the shape of a cotton compress. The child is weaned. In phlegmonous disease early incisions are very necessary, and after this the application of a compress and bandage. At the start, lukewarm compresses of lead-water afford great relief to the pain.

Inflammation of the perimammary connective tissue may occur primarily and spontaneously, or it may be produced secondarily by periostitis and caries of the ribs or the perforation of a pleuritic exudation. The pus which has been formed may make its way internally or externally, may terminate fatally by purulent pleurisy, or may perforate in various ways under the breast. If the inflammation and collection of pus are situated behind the mamma, the latter is separated from the thorax and appears to be movable on an elastic base; the surrounding parts, like the integument of the breast itself, are sometimes very œdematous. At the beginning of the disease the pains are often very severe, and associated with high fever. The mobility of the arm on the affected side is impeded by increase of the pains. Such abscesses may attain enormous dimensions; from one abscess Stoltz evacuated 300 gm. pus by incision. There are sometimes several non-communicating perimammary abscesses. At first the integument of the breast is not red, but only tense, and the subcutaneous venous network is markedly dilated. Inflammation of the submammary connective tissue very rarely resolves; suppuration almost always occurs very rapidly. Early evacuation of the perimammary abscesses by free incisions at the edge of the breast and by the introduction of drainage tubes remains the main element in treatment. In addition, complete discharge of the pus must be effected by moderate compression of the breast. Fistulous canals which are left over may be completely healed in 10–12 days by a compress or bandage or by injections with a solution of iodine (1 : 4).

CHAPTER III.

Inflammation of the Parenchyma of the Breast. Mastitis parenchymatosa seu lobularis.

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Inflammation of the parenchyma of the breast is partial or total. The inflammation usually starts from the walls of the lacteal ducts, extends to the vesicles of the gland, and often terminates quickly in suppuration. With the suppuration of the interacinous tissue appears the mammary abscess, which very rarely has smooth walls; usually only sinuous, uneven excavations can be recognized. Thick, nodular, necrotic shreds of the glandular parenchyma are sometimes contained in the pus, and are discharged during its evacuation. The terminations are spontaneous perforation and evacuation, which are usually followed by absorption of the remaining exudation with complete recovery. In addition fistulous tracts may be left over; they either secrete pus alone or persist for a long time in lacteal fistulæ. So-called milk nodes are sometimes left over. They are indurated parts, of a nodular character, in which the hyperplastic connective tissue has constricted and obliterated a part of the gland, so that the ectatic remains of lacteal canals are usually found within them. It is said that the abscess sometimes becomes encapsulated and the inclosed pus undergoes fatty degeneration or calcification. Klob explains in this way the tubercle-like or chalky calcareous concretions, surrounded by retracted callosities, which are found occasionally in the breast. Putrid decomposition of the pus, septicæmia and death may also occur in mastitis. Finally, the abscess may remain stationary for a long time and only give rise to severe inflammatory symptoms at a late period—a circumstance which may cause it to be mistaken for a malignant tumor (*Degliocchi*).

Symptoms.—If lesions of the nipple are the cause of the inflammation, it usually begins from the eighth to the eleventh day. The nodule is movable at first and is not adherent to the skin. The skin soon begins to grow red, the nodule increases in size, movement of the arm becomes painful, the axillary glands enlarge. With increasing dull pains and the development of a severe chill the skin at one spot becomes pointed, bluish-red and œdematous, and perforation of pus occurs at one or more small places. Velpeau once found fifty-two abscess foci in a mammary gland. The points of perforation often close up and after marked swelling of the breast, severe pain and higher fever, the evacuation of the pus occurs again at another part of the integument. This suppuration is usually attended with high fever, which rises rapidly to 104° F., even to 107° F., but falls with equal rapidity after perforation and passes into a protracted slighter fever. The great frequency of the pulse (up to 160) is often striking. In rare cases only subfebrile temperatures are observed. Kiwisch had called attention to the fact that, with a subacute course of the inflammation, the symptoms often become more severe after the opening of the abscess and the patient may then succumb to pyæmia.

Etiology.—Inflammations of the breast occur more frequently in nursing women, much more rarely in those who are not nursing. Almost 6 per cent. of all nursing women are attacked, blondes and brunettes with equal frequency, but primiparæ much more frequently than multiparæ.

The usual cause of mastitis is wounds of the nipples, not alone while the latter are still present, but even 8–14 days or more after they have entirely healed. The inflammation often creeps very slowly from the lacteal excretory ducts to the periphery of the gland. Hence, the site of the diseased acini corresponds to that of the excoriation on the nipples. In the cases of puerperal mastitis which are not preceded by an affection of the nipple, it must be assumed that the irritant enters the milk duct directly (*Birch-Hirschfeld*). All the bacteria which are known as producers of pus have been found in mammary abscesses, the staphylococcus pyogenes aureus most frequently and constantly. Bumm and Escherich have demonstrated the presence of bacteria in the still unaffected gland, and always of the same variety as those found in the excoriations. Cohn found a special streptococcus in parenchymatous mastitis.

From my experience I cannot admit that interference with the evacuation of milk is the most frequent cause of mastitis; nor have I been able to detect too sudden interruption of lactation as a cause.

Injuries, for example, a blow of the child against the breast, rarely take part in its development. It occurs more often in scrofulous and feeble than in vigorous individuals.

It begins most often in the first four weeks after parturition, particularly in the second half of this period.

Mastitis occurs chiefly in the lower portions of the breast; this is explained by the dependent position and greater infiltration here, owing to the action of gravity. It is found with equal frequency on the right and left sides.

If cicatrices are left over after mastitis, traction during nursing in subsequent childbeds sometimes produces another attack of mastitis. Finally, parenchymatous mastitis has also been observed in the course of puerperal metastatic pyæmia (*Scharlau*). But as Scanzoni has justly remarked, this metatastic mastitis is extremely rare, and only two cases have come under my observation.

Treatment.—The child must be put less often to the affected breast, and if the inflammation increases, must be taken away entirely. It may be allowed to nurse at the other breast if this is healthy.

Lukewarm compresses of lead water, continued every 4–5 minutes, day and night, are applied to the diseased breast, which is thoroughly supported by a cloth. The compresses are continued until the nodules have entirely disappeared. As soon as fluctuation is felt, a sufficiently free incision is made, the pus evacuated completely, a short drainage tube introduced, and a compress and bandage of Lister's gauze is applied. From the beginning of suppuration to the closure of the incision, the average duration of recovery is fourteen days. I do not use the compress and bandage before suppuration occurs. If the lead-water compresses do not give relief, uniform compression will be of no avail and will only cause pain. Seutin was the first to recommend the paste dressing for the breast, and Kiwisch used it, prior to 1840, with excellent results. The effects of other pressure dressings prove that the compression of the breast is the effective agent.

The use of warm poultices is entirely superfluous and obsolete.

For the relief of milk nodes which have been left over, we may rub in gray ointment, or ung. potass. iodidi, or dressings of emplast. saponat., emplast. de cicuta, emplast. melliloti, and may give iodine, potassium iodide and mercury internally, if the child is weaned.

The English use belladonna (extr. belladonnæ, glycerini āā p. æ.) externally for the absorption of exudations, the prevention of suppuration and the diminution of the secretion of milk.

CHAPTER IV.

Anomalies in the Secretion of Milk.

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Harlau, Reil, Pitschaft, Hohnbaum and Berndt, Jr., assure us that they have repeatedly observed the *complete absence* of the formation of milk in lying-in women, and have found this in several successive childbeds in the same woman. I have never observed complete absence of the milk. The causes of such absence mentioned by these observers are: too great delicacy and youth or too advanced age of the woman, male physique, torpor of the breasts, great tendency to obesity, premature births, and delivery of stillborn children. The observations, also, make it probable that this anomaly may be inherited by the daughters from the mother.

Too slight a secretion of milk, *i. e.*, not entirely sufficient for the nourishment of the child, is due to the same causes. Diminution of the previously sufficient secretion is found, apart from recurring pregnancy, after severe vital losses, considerable hemorrhage, diarrhœa, severe catarrh, also after the return of menstruation. Intense emotional excitement, inflammations of the parenchyma of the breast, and other acute diseases, also lead to diminution or premature cessation of the secretion of milk. In the frequently occurring disappearance of the milk in freshly engaged wet-nurses, emotional excitement, change of diet and excessive bodily exercise, as a rule, work together; one of these causes is rarely found alone. It is a well-known experience that individuals who have already nursed lose the milk much less frequently than those nursing for the first time, because they recognize and avoid the causes. During the siege of Paris, Decaisne found that, in 43 nursing women, the secretion of milk, as the result of insufficient nourishment, continues at the cost of the maternal organism, as it does in animals. Furthermore, all the solid constituents, casein, butter, sugar and salts, are diminished, the albumin alone is increased, and the amount of the latter always stands in inverse proportion to that of the casein. In exceptional cases (twelve) the child thrived when the milk was tolerably fair in quantity and quality. Fifteen children emaciated, and suffered, in great part, from enteritis. In sixteen women the milk disappeared almost entirely, and more than three-fourths of the children literally died of hunger.

As a rule, no special symptoms are produced when the secretion of milk remains absent, diminishes or is lost. In acute febrile diseases, Becquerel and Vernois found the amount of milk considerably diminished, its solid constituents (butter, cheese, salts) increased, but the sugar diminished. When the hyperæmia and inflammation of other parts have subsided, the secretion of milk may begin again or may increase, in otherwise healthy individuals.

The *treatment* of insufficient secretion of milk is regulated according to the causation. When the nutrition is imperfect, nourishing diet, stimulants, a large amount of fluids, good beer, milk, oatmeal gruel are to be recommended. If there are vital losses, these must first be relieved; the child is put to the breast more rarely or not at all, and is gradually allowed to nurse again only after the secretion of milk increases with convalescence. At first we must sometimes give the child other food in addition to the milk, and then gradually diminish the amount of the former. If the wet-nurse's milk fails without any demonstrable local affection, we may try strong beer, less frequent application of the child, the administration of the celebrated fennel or anise tea, or the so-called milk powder (consisting of pulv. sem. fœnic., sacch. alb., flavedo cort. aurant., āā 2 gm., magnesia carbonat., 4 gm.). But this often fails of success, and the best measure is the speedy procuring of another nurse. In eight cases of agalactia Skinner claims to have used electricity with favorable results. Attention must also be paid to the character of the diet. According to Ssubotin the amount of milk is enormously diminished by fatty food; a vegetable diet also diminishes the amount of butter and casein, but increases the sugar. A meat diet, on the other hand, is said to increase the fat and casein in the milk but diminish the sugar. If the return of menstruation is the cause of a considerable diminution of milk, the nursing may be continued only when, despite menstruation, the milk remains abundant, the nurse is vigorous and the child takes the breast readily. Becquerel and Vernois found that, during the period of menstruation, the milk of nursing women contains less sugar, but more casein and extractive matters, and they observed no disadvantage from the continuance of nursing by menstruating women.

It is sometimes found that nursing and non-nursing women secrete *an enormous amount of milk*, so that they are thoroughly wet several times a day by the escaping milk. It also happens that the secretion continues uniformly after the child is weaned, or is even greater than before. The former condition is called *polygalactia;* it is found in the lean and the stout, in delicate blondes and vigorous brunettes. It possesses little significance so long as the general condition of the lying-in woman is not disturbed by the large discharge of milk, or there is no tendency to illness on account of the wetting. A different condition obtains in the so-called *galactorrhœa*, or uninterrupted escape of milk after weaning the child. The causes of this affection are still unknown. Unusual irritation from excessively prolonged nursing of the child is by no means a frequent cause. Abnormally excessive production of milk does occur, but whether the annular layer of strong elastic fibres of the excretory milk ducts is relaxed and opposes no resistances to the escaping milk from the start, or whether this questionable relaxation is a result of the disease itself, remains undecided. The latter assumption appears to me more probable. The breasts are found either flabby or rigid, somewhat tense, even sensitive. The daily amount of milk is very variable; 4–7 litres have been measured (*Guéneau*). The milk is thin, almost watery, and poor in casein. Both breasts are usually affected, more rarely only one.

Vigorous persons can tolerate such a profuse discharge of milk for a long time without injury, but feeble individuals often exhibit threatening symptoms, which have been called tabes lactea, and are identical with those of oligæmia. The amount of blood diminishes; the nutrition is impaired; the individual grows pale and emaciated; the temperature falls. The cutaneous secretions diminish; the skin becomes dry and flabby; the muscles are easily tired, and are painful on using. The secretion of the larger glandular organs also diminishes, hence lessened excretion of urine, which is concentrated and dark; the bowels are constipated, the appetite lost, digestive disturbances of all sorts, pressure in the epigastrium, distention of the abdomen, eructations, etc., make their appearance. The pulse is small and accelerated; the respirations more frequent than usual; headache, palpitation of the heart, a feeling of oppression and syncope are often noticed. The patients become very excitable, lachrymose, and have a tendency to spasmodic conditions. The same symptoms also develop when women nurse too long: annoying pain in the back on putting the child to the breast, gastric pressure, loss of appetite, muscular weakness, headache, hallucinations, visual disturbances, palpitations and a chlorotic appearance—symptoms which also occur after a brief period of nursing, when the woman's condition of health does not warrant nursing (*Nunn*).

Cramps and *contractures* are found in nursing women, particularly in the upper limbs and neck muscles. They begin usually with tingling in the fingers, followed by contractions of the plexus of the fingers and hand. The contractions are painful. The paroxysms vary in duration, from a few minutes to hours, occasionally recur very often (ten to twelve times) in a day, and are often produced on applying the child to the breast. During the attack, the patient can retain nothing in the hand; the sensibility is diminished. Trousseau often found speechlessness, difficulty in swallowing, and orthopnœa during the paroxysms. The affection sometimes appeared first on one side and then on the other, or on both sides simultaneously. As a rule, vigorous diet, weaning the child, and the administration of iron and quinine, exercise a very rapid and favorable influence.

Eastlake observed visual disturbances, especially a more or less complete amaurosis, in eight successive childbeds in the same woman, each time with total blindness on the second or third day. No change in the refracting media and the retina was found by competent ophthalmoscopists. The blindness usually disappeared in three to five weeks.

Treatment.—The excessive secretion of milk may be diminished by low diet, profuse evacuations from the bowels, moderate compression of the breast and not too frequent application of the child.

Of the many remedies recommended against galactorrhœa only two have maintained their good repute, viz., iodine and potassium iodide administered internally, together with a compress and bandage. The iodide is given in pill or solution (0.3 at a dose) three times a day for ten to fourteen days; the bandage is applied so long as milk continues to escape and is changed as often as it becomes wet. At the same time nourishing diet is given.

If the above-described symptoms of oligæmia appear in a nursing woman, the child must be weaned at once and improved nutrition secured by generous diet of wine, quinine and iron. The symptoms will then soon subside.

SECTION III.

Puerperal Diseases of the Non-sexual Organs.

CHAPTER I.

Diseases of the Urethra and Bladder.

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The anterior wall of the vagina is often pushed downward by the descending parts of the child and the bladder and urethra are pressed beneath the arch of the pubis, so that small extravasations of blood occur into and beneath the mucous membrane. According to Mattei and Olshausen a flexion of the previously very much elongated urethra it also produced by the sudden descent of the uterus after parturition. Swelling of the urethra also occurs secondarily in ulcers near the urethra, in the introitus vaginæ and the vagina. This is also true of the bladder. While in non-puerperal women the affection of the mucous membrane is most frequently the primary form, in puerperal women the affection of the vesical wall occurs, with at least equal frequency, as *pericystitis;* œdema and purulent infiltration of the connective tissue in the parts situated between the base of the bladder and the genital canal; *serous cystitis* after primary disease of the peritoneum is rarer. The muscular coat of the bladder is also infiltrated with serum or pus, the mucous membrane shows catarrhal swelling. Grayish-green crusts of irregular shape and varying size are seen occasionally in small parts of the vesical mucous membrane. After the destruction of such patches ulcers develop and may produce fistulæ from perforation of the wall of the bladder, or give rise to vesical hemorrhages and long-standing cystitis.

The *symptoms* are pain and difficulty in micturition. The latter may increase to complete retention in marked swelling of the urethra. It occurs less from the swelling and paralysis of these parts than from the flexion of the urethra following the evacuation of the uterus. On account of this flexion of the urethra, the urine, despite the great distention of the bladder, does not reach that part of the urethra from which the desire to urinate is excited in a reflex manner. In contusions, the ischuria usually develops soon after confinement, in vaginal and uterine ulcers 3–6–8 days afterward. This is also true of retention of urine as a symptom of serous cystitis; it is by no means always present, and sometimes appears at a late period. The results of ischuria have been discussed on page 762. If the urine must be drawn frequently with the catheter, bacteria, which, according to Bumm's investigations, are very similar to gonococci, are apt to be introduced and give rise to further disease of the mucous membrane. The latter may be separated in the shape of vesicles and in large shreds, or even in tubular pieces, which, exactly like diphtheritic patches, are infiltrated by small-celled, partly fatty masses and delicate fibres of fibrin, and are evacuated in the urine (*W. Martyn, Spencer Wells, Barnes, Hausmann* [who collated the cases in point], *Schatz, Otis, Boldt*). Even the submucous tissue and parts of the muscular coat of the bladder (*vide* page 235) have been found in the discharged pieces. The duration of the urethritis and cystitis is rarely longer than fourteen days. If the acute disease is followed by catarrh of the bladder, the discharged urine contains a sediment (destroyed epithelial cells, urinary salts, especially ammonio-magnesian phosphates); the patients squeeze small mucous plugs through the urethra, occasionally with great difficulty. This is attended with pain; the urine then flows more easily. According to Kaltenbach, albuminuria often occurs in puerperal catarrh of the bladder, also in general catarrh of the urinary passages with pyelitis, in circulatory disturbances and in parenchymatous renal affections.

Diagnosis.—In croupous exudation small shreds escape in the urine; in extravasations it becomes bloody. If it is mixed with urine in large quantities, the rupture of a parenchymatous abscess is probable, provided that the kidneys were healthy and no peritonitis or parametritis discharged its exudation through the bladder. Pain on the contact and introduction of the catheter, and difficulty in its passage through the entire urethra, speak for inflammatory swelling of the parts.

The *causes* are: Contusions during labor, puerperal ulcers in the vicinity, especially close to the orifice of the urethra, parametritis, peritonitis and retroversion of the gravid uterus (*vide* page 234). These affections are more frequent in primiparæ than in multiparæ. Catarrh of the bladder is produced solely by the bacteria which are introduced exceptionally without the catheter, but usually with this instrument.

Treatment.—As a prophylactic measure we may allow pregnant women to practice micturition in the recumbent position. In puerperal women the ulcers present must first be treated. At the same time they must be directed to micturate regularly every three hours. If this cannot be done in the recumbent position, it may be attempted in the knee-elbow or sitting position. The catheter should not be used unless necessary, and not alone must a clean instrument be employed, but the nymphæ must be separated and the surrounding parts and orifice of the urethra carefully cleaned with disinfectants, lest the lochia be carried into the bladder through the catheter, and vesical catarrh produced in this way. When the pains are severe we may give emulsions internally, with narcotics (extr. hyoscyami, tinct. thebaic., 1.2 : 200), also apply warm fomentations to the abdomen and inunctions with lin. volatile (30.0) and tinct. thebaic. (10.0). Carbonated waters (Seltzers, soda water, light weiss beer) are advisable when the ischuria is protracted. Iron, balsam of copaiba and oil of turpentine are not to be recommended so long as there is pain.

In persistent catarrh of the bladder, in addition to regular evacuation of the organ, injections with one-per-cent. solutions of nitrate of silver, tannin, 10.3 : 30), carbolic acid (one per cent.) or salicylic acid (one per cent.), one litre several times a day, are very useful. This method also does admirable service in obstinate ischuria without catarrh of the bladder. The fluids should have a temperature of 90°–95° F. Internally, lime-water and milk, Ems or Neuenahr lozenges, a milk or whey cure are advisable, and among the baths, Vichy, Ems and Neuenahr are especially recommended.

Inflammation of the Ureter and Renal Pelvis in Puerperal Women.

Puerperal Pyelitis.

Kaltenbach first called attention to the frequency of puerperal pyelitis, and demonstrated its connection with inflammatory processes in the vicinity of the uterus. Even as early as 1861 A. Stadfeldt had called attention to the fact that the disease may also be caused by distention of the ureter and the renal pelvis in the puerperal state, resulting from the mechanical pressure of the puerperal uterus against the common iliac artery. The ureter is said to be compressed between the uterus and iliac artery more vigorously on the right side than on the left. At the end of the first week of childbed Stadfeldt found the mucous membrane of the ureter hyperæmic and the renal pelvis filled with an opaque, flocculent mass, although there had been no previous disease of the bladder or the mucous membrane of the renal pelvis. Inasmuch as Kaltenbach also mentions such cases with obscure etiology, Stadfeldt believes that these also must be interpreted as the result of the stasis of urine from pressure of the puerperal uterus upon the right ureter. This acute distention of the upper part of the urinary passages is also said to be the reason that renal calculi are passed with comparative frequency during childbed.

Fever, lumbar pain and the presence of epithelium of the renal pelvis with albuminuria characterize the pyelitis, whose relief is generally easy, and often occurs spontaneously, but is sometimes very difficult, despite all measures. Injections into the bladder, the regular evacuation of urine, mild diuretics, iron and the prolonged use of warm baths are indicated.

CHAPTER II.

Affections of the Pelvic Articulations.

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The hemidiarthroses of the pelvis may develop during pregnancy into perfect joints, and their otherwise trifling contents may be considerably increased. Even before the more intimate structure of the semi-arthroses of the pelvis minor was known, it was recognized that disease usually begins at their centre and extends toward the periphery. With the hyperæmia and inflammatory swelling of the synovial membrane, there is increased secretion of synovia, so that the ends of the bones are separated from one another. If the inflammation passes into suppuration, the cartilage is laid bare, eroded, even perforated, completely destroyed in parts, and the bone becomes carious; *an abscess of the joint* develops. The surrounding soft parts become infiltrated with serum, pus or ichor. The abscess may discharge into the pelvis minor and externally, undermine the skin over a large area and pass in various directions.

These affections may be primary or secondary (metastatic). In the latter event they are preceded by the symptoms of pelvic phlegmons or metrophlebitis, and at the autopsy other metastases are usually found. It is possible, however, that even in these cases the abscess of the symphysis was primary, and that the pyæmia started from it. Sometimes all three joints are attacked, more often only one. The usual symptoms are pains around the diseased joint, which radiate into the lower limbs, and are felt chiefly on attempting to sit up or to lie upon one side. In addition, disturbances of function set in, the patients being unable to walk at all, or dragging themselves along with difficulty with the aid of crutches. In walking, the patients press the knees against one another and slide the feet along the floor without lifting them. Hence the gait has much similarity to that of osteomalacic women. Or the women drag one leg slowly after the other, at the same time sinking from one side to the other, so that they have a waddling gait. A sensation of heaviness, lameness and formication is felt in the legs. When the symphysis pubis is attacked, severe pain is sometimes felt during micturition. In the cases in which a more abundant production of synovia has taken place, the ilium of the side upon which the weight is falling may be pushed upward in walking, as was observed by Débout. In one of Scanzoni's cases, according to the statement of the patient, a distinct elevation of the hip of the right pubis could be felt at the symphysis on raising the right lower limb with the hands.

If pus forms, the pains increase, chill and fever set in, the lower limbs can no longer be moved on account of the pain, and the vicinity of the joint soon begins to swell. Large purulent swellings may thus develop in the mons veneris, inguinal region, and also upon the ilium and sacrum. The terminations are absorption, complete resolution and recovery (this is the most frequent and occurs in 2–3 weeks in mild cases); also suppuration and perforation, followed by recovery in 4–6 weeks. Not infrequently there is chronic relaxation of the joint which may last for years (17 and 50 years, *Danyau*). A relapse of the affection may also occur during the next pregnancy and childbed. Metastatic suppuration of the pelvic joints may greatly accelerate the fatal termination. In rare cases septicæmia or pyæmia follows primary disease of the joint (*Grenser*).

Diagnosis.—It is easy to recognize the disease. A characteristic feature is the site of the pains, which are located by the patients exactly in the diseased spot. Pains in the limbs occur chiefly on movement, and are attended with increased pain in the diseased pelvic parts. The joint is very tender on pressure from within or without. Fluctuation, swelling, redness and high fever indicate the beginning of suppuration.

Etiology.—The disease may develop after easy and rapid labors or after difficult labors which were terminated artificially. Fordyce Barker remarked that it often occurs in normal and unusually wide pelves, in which the head remains for a long time on the floor of the pelvis. Stoltz found it in general plethora, in very obese individuals, in cachectic conditions, after excessive exertion and unusual dimensions of the pregnant uterus. The pelvic articulations may also be stretched by a large, hard child's head. The inflammation may be produced occasionally by a push or blow (*Grenser*). Relaxation of the joints may also occur after an abortion (*Courot*). Débout has observed it repeatedly during pregnancy (usually the 7th or 8th month), after severe exertion, the lifting of heavy weights. Among 222 autopsies on puerperal women Tonnellé found pus only twice in the symphysis (*vide Litzmann*, "Kindbettfieber," p. 232).

The *prognosis* is very favorable, in accordance with the above remarks, in primary cases. Complete recovery usually takes place in a few weeks. The prognosis is less favorable when an abscess forms. If the cartilage is destroyed, ankylosis naturally follows, unless death occurs earlier. The ankylosis is of slight importance, however, when the pelvis is fully developed.

Treatment.—Scanzoni secured complete recovery, within eight months, of relaxation of the symphysis and sacro-iliac synchondrosis by means of iron preparations, inunctions of narcotic ointment containing potassium iodide, in the vicinity of the diseased joints, lukewarm ferruginous baths and Brueckenauer mud baths. The ice bag and inunctions of narcotics or blue ointment are indicated at the beginning of inflammation and when the pains are severe. As a matter of course, the women must remain in bed and avoid all exertion. In feeble individuals Stoltz recommended iron and quinine internally, together with stimulant inunctions and cold washings. Ferd. Martin has devised a cushioned, steel pelvic girdle, whose spring is curved from behind and above forward and downward and, running parallel to the crest of the ilium, is intended to keep the ilia in apposition. When suppuration occurs, early evacuation of the pus by incision is indicated. If the disease becomes chronic, the use of sea bathing, douches, inunctions, and especially the administration of the waters of Baden-Baden are to be recommended (*Stoltz*).

Complete rupture of the pelvic articulations occurs occasionally, partly in the course of difficult but spontaneously terminated labors, partly after mild, but usually after severe, obstetrical operations, hence especially in contracted pelves. Scanzoni observed rupture of the right sacro-iliac synchondrosis after a labor which had terminated without the aid of art. It is more frequent as the result of forceps operations. Ahlfeld found rupture of all three joints after a very difficult operative labor in a rachitic flat pelvis. In Galvagni's cases one rupture occurred spontaneously during labor in a 37-year-old secundipara, with normal dimensions of the pelvis and child's head. In the second case the rupture occurred on the second day of childbed, in a woman who had been delivered ten times, as the result of stepping from the bed to a low stool. Ulceration set in, and the woman died forty-one days post partum.

The *symptoms* are violent pains, with a sensation as if something were torn. When the rupture is entirely isolated, suppuration, perforation of the pus, for example, through the integument of the gluteal region (*Scanzoni*), and recovery may occur. Duchênne mentions incontinence of urine and violent pains along the sciatic nerve as symptoms of the affection. The prognosis is, at least, doubtful.

Treatment.—Ice bag or ice compresses; decubitus on one side if only one sacro-iliac synchondrosis is torn. If an abscess develop, an early incision must be made, and when the inflammatory symptoms are relieved, the application of a firm pelvic girdle is necessary; without this, movements, at the start, are not possible.

CHAPTER III.

Neuralgias and Paralyses of the Lower Limbs.

LITERATURE.

Basedow: *Casper's Wochenschrift*, 39, 1838. Berndt: "Krankheiten der Wöchnerinnen," p. 428 ff. Helfft: *Monatsschrift für Geburtskunde*, IV, 269. Leyden: "Bericht," pp. 58 and 70. Möbius: "Neuritis puerperalis." *Münchener med. Wochenschrift*, 1887, XXXIV, 153. Nöggerath: *Deutsche Klinik*, 50, 1854. Warmont: *Gaz. des hôpitaux*, 1857, p. 371.

The puerperal neuroses of the lower limbs are located chiefly in the nerve trunks, more rarely in the nerve centres, and generally owe their development to parturition. Injurious pressure is effected by a large, hard child's head, unfavorable presentation and in small pelves. Vigorous compression may result in complete interruption of conduction at the compressed spot. This occurs in instrumental aid during labor, inasmuch as the rim of the blades of the forceps may produce severe contusions of the sacral plexus on forced closure as well as during extraction. The thick nerves are also compressed not infrequently by a pelvic exudation or small extravasations from the neighboring parts extend to the sheaths of the nerves, or hyperæmia and œdema of the neurilemma appear spontaneously. We have already mentioned on page 790 that parametritis may give rise to such neuralgias. The location of the affection is in the external and middle cutaneous, obturator or sciatic nerves. The two latter nerves are especially apt to suffer during labor. Even slight pelvic exudations, for example, one resulting from periphlebitis, may make a nerve incapable of conduction without compressing the entire nerve trunk (*Leyden*). Injuries of the vagina, with subsequent severe cicatricial contraction, may also exercise traction and pressure on individual nerve trunks of the pelvis minor, and hyperæsthesiæ and motor disturbances may thus be produced.

The motor and sensory disturbances caused by venous thrombosis in the lower limbs have been discussed on page 828.

Lesions of the sacrum (caries, tumors), tumors of the ovaries, uterus and tubes may also exercise pressure on these nerves, but such causes of neuralgia of the thigh are rarely found in childbed. Finally, puerperal neuroses of the lower limbs also occur in diseases of the central organs.

Symptoms.—The pains and twitching which are produced during labor by pressure on the obturator nerve appear in the pectineus, adductor and gracilis muscles; those which occur on irritation of the sciatic nerve appear mainly in the calves of the legs. Both disappear commonly soon after delivery, but a feeling of numbness sometimes persists for a short time. Usually only one limb is affected. If exudations form in the further course of childbed, there is often found a crural neuralgia, with severe pains on the outer or inner aspect of the upper part of the thigh, usually extending only to the lower third, but sometimes as far as the knee. This neuralgia is located in the external or middle anterior cutaneous nerve. In obturator neuralgia the patient feels the pain on the inner side of the thigh over the adductors and drags the limb in walking. More or less severe sciatica is still more frequent. The pain is felt usually in the calf, ankle, dorsum and sole of the foot, also in the course of the nerve along the entire limb beginning behind the trochanter major. Standing and walking are sometimes impossible, and the patient complains of numbness and coldness in the limb. Sensation is sometimes unaffected, occasionally diminished, but cutaneous hyperæsthesia may also be present. Even violent convulsive movements of one or both limbs appear in certain cases. The integument of the limb is pale, not swollen, the joints are movable and normal, the pain is increased by pressure on certain places (tuber ischii, popliteal space, etc.). If the disease has lasted for some time, the affected limb wastes away, the muscular irritability appears diminished, the limb is cooler, and, finally, complete paralysis results. If these symptoms are due to an exudation, the pains and immobility may diminish rapidly and disappear entirely with the absorption of the exudation or the evacuation of the abscess which may have developed. The termination in complete permanent paralysis is rare in puerperal women, and I have only seen one case of this kind. Romberg noticed disturbances of sensation and motion, anæsthesia of the sole of the foot, annoying feeling of weakness in walking. As a rule, the affection is associated with fever, whose type varies according to the causation.

On examining the affected limb and the internal genitalia by pressure on the pelvic walls, the patients will manifest pain at once and describe accurately its situation. When the disease is located centrally, we find, as a rule, rush of blood to the head, hebetude or loss of consciousness, often coincident implication of the upper limb; the symptoms in the lower limbs are not as prominent as in sciatica and crural neuralgias.

Treatment.—The position of the parturient woman, the position and introduction of the necessary instruments, must be carefully watched, in order to prevent hurtful pressure upon the pelvic walls. Nevertheless, this is sometimes produced despite the greatest care. If the pains continue after the termination of labor, relief is soon secured, as a general thing, by narcotic inunctions, by enemata containing a few drops of laudanum or chloral hydrate (1.0), or by mustard poultices. In puerperal extravasations and exudations the pain can be diminished by hypodermic injections. The pains will also diminish with the treatment of the cause. If not, we may use veratrine, cocaine, chloroform, chloral hydrate and morphine in ointments as local applications, mud baths in chronic neuralgias. Antipyrine and phenacetin (0.5 three times a day) may be given internally.

As an appendix, we may here refer to—

Puerperal Tetanus.

LITERATURE.

Arnold: *Med. Correspondenzbl. der württ. Aerzte*, 1884, LIV, 209, 212. Dejust: *Bull. soc. méd. de l'Yonne* (1881), 1882, XXII, 25. Ehrendorfer: *Wiener med. Wochenschrift*, 1883, XXXII, 5. Keeling: *Brit. Med. Jour.*, London, 1883, I, 115. Kiralyfi: *Pester med. chir. Presse*, 1886, XXII, 153. Scheef: *Med. Correspondenzblatt d. württ. Aerzte*, 1884, LIV, 185.

Tetanus occurs very rarely during parturition. As is well known, it is produced by a specific poison, and is accordingly an infectious disease (*Brieger*). It has been caused by tamponing after severe hemorrhages, also after abortion (*Dejust*) and operative procedures, and is also said to occur more frequently in puerperal women in warm climates. The prognosis is bad; only 19 per cent. of the patients recover. The treatment is the usual one. I have never observed a case.

CHAPTER IV.

Mental Diseases in Puerperal Women.

LITERATURE.

Arndt: "Ueber Puerperalpsychosen," *Berliner Beiträge zur Geburtshülfe und Gynäkologie*, Vol. III, Part 2, p. 101. Brémaud: (Cure by suggestion), Compt. rend. de la Soc. de biolog., Paris, 1887, 8 s., IV, 345. Bottentuit: "De la manie des nouvelles accouchées," *L'union médic.*, No. 34, 1874. Fürstner, C.: "Ueber Schwangerschafts- und Puerperalpsychosen." Hall, Archibald: London Obstetrical Society Transactions, Vol. IV, p. 222–228. Ideler: *Charité-Annalen*, II, Jahrgang, 1852. Kiwisch: "Krankheiten der Wöchnerinnen," II, p. 228–261. Leubuscher: Verhandlungen der Berliner geburtshülflichen Gesellschaft, Vol. III, p. 94–122. Madden, Thomas More: "On Puerperal Mania," *Brit. and For. Med.-Chir. Review*, Oct., 1871. Savage: "Observations upon the Insanity of Pregnancy and Childbirth," "Guy's Hosp. Rep.," XX, p. 83. Simpson, J. Y.: "Clinical Lectures on Diseases of Women; Puerperal Mania," Philadelphia, 1763, p. 437–461. Weill: "Considérations générales sur la folie puerpérale," *Thèse de Strasbourg*, 1851, 4°.

At almost no other period of life are all the factors, predisposing as well as exciting (losses of blood, conditions of weakness, congestion of the central organs, defective constitution of the blood, bodily and mental suffering), so often found united as in childbed. Hence, the frequency of puerperal insanity is not surprising.

The forms of psychical disturbance which are found most commonly in puerperal women are *mania*, *hallucinatory insanity* and *melancholia*. Monomanias are more rare, and dementia occurs only as a termination of chronic mania and melancholia. The mania was regarded by some as peculiar to the puerperal state, but in its external manifestations it can by no means be distinguished from ordinary mania. With regard to the causal conditions, we may divide these diseases, with R. Leubuscher, into *three groups*, viz.: "1. Those cases which have only the significance of a febrile delirium—symptomatic. 2. Puerperal mania, based on and developed through conditions which prepared the insanity long before childbed, but the outbreak of which is due to parturition or childbed as exciting causes. 3. Cases of mania after eclampsia, profuse hemorrhages, severe bodily and mental suffering, without hereditary predisposition—the idiopathic puerperal manias proper."

Symptomatic puerperal mania has been observed in endometritis, phlegmonous metritis with thrombosis of the lymphatics and veins, sore nipples, suppurating mastitis. It is most frequent in the first eight to ten days of childbed. The forms of this delirium vary greatly; sometimes there are only gay notions, merry songs and a joyful expression of countenance, despite severe disease. Sometimes, especially when the pains are severe, conditions of terror set in. The patient throws herself restlessly to and fro, sees threatening shapes, becomes excited and jumps from bed, striking those around, etc. Others sit sadly, with fixed gaze and lachrymose expression, and are distressed constantly by thoughts of death. The duration of the primary disease may exceed that of the delirium; the latter sometimes disappears, despite the fact that the primary disease does not improve, or even grows worse. If the causal affection warrants a favorable prognosis, we can predicate, with tolerable certainty, the speedy cessation of the delirium. This form is merely a symptom of another disease, and not a permanent mental affection.

Treatment.—The hyperæmia is to be treated symptomatically with the ice-bag and derivation to the intestines with cathartics or drastics.

Causes.—With regard to the causes, the generally mentioned changes in the constitution of the blood during pregnancy, the circulatory disturbances and formation of osteophytes, Weber came to the conclusion that it is impossible, in the majority of cases, to attribute the outbreak of a psychosis directly to one or more of these factors, or to prove that one of the latter was present in any more marked degree prior to the outbreak of the psychosis than in numerous other cases in which there is not the slightest psychical affection.

In three per cent. of the cases Weber noted the development of true insanity as the continuation of symptomatic delirium.

In a number of mental affections during pregnancy we must assume a purely sympathetic affection of the brain, similar to that produced by parasites in the intestinal canal, especially in those cases in which, under the same conditions, the same phenomena always make their appearance.

Among the predisposing factors is heredity, present in 28.5 per cent., a proportion which corresponds very closely to that in all insane women (30 per cent.), so that a predominance of this factor in puerperal psychoses may be excluded. Among those predisposed by heredity, only a small proportion exhibit certain deviations from the normal in the previous history. The majority are perfectly intact mentally prior to the acute affection. The hereditary predisposition is found with special frequency in those attacked during lactation.

Individual predisposition, from imperfect psychical development or previous attacks of alienation, or notable weakness, anæmia, hysteria, imperfect development of the circulatory organs, is even rarer than in other forms of mental disturbance.

Weber did not detect any special danger to primiparæ, as was found by Madden.

Nor did he confirm the increased predisposition with advancing years, upon which Marcé laid special stress.

According to Weber's observations, no very striking influence can be attributed to the different emotional conditions found in married and unmarried women. Want, marital unhappiness and similar factors were present in about sixteen per cent. of the married women. The sex of the newborn child exerted no influence.

With regard to the exciting causes, no special somatic disturbances could be noticed during pregnancy, nor was parturition very difficult with unusual frequency.

A considerable proportion of puerperal psychoses only develops after the lochia have ceased. In the other cases the disease is present, as a rule, before the cessation of the lochia or lactation, and a considerable number nurse the child until the day of admission to the asylum.

Febrile diseases, such as mastitis and metritis, are also rare as occasional causes.

Very intense emotional excitement can be recognized, with a certain degree of probability, as the cause of the outbreak in 4 per cent. of the cases.

Among 1996 cases Madden found 1239 between the ages of twenty and thirty years, primiparæ absolutely more frequent than multiparæ, unmarried more frequent than married women (883 : 341).

Cases in which puerperal mania was left over for some time after eclampsia have been reported by Bibergeil and Archibald Hall, but, on the whole, are very rare.

Symptoms.—The large proportion of cases of puerperal psychoses begin ten to twelve days after confinement, a smaller number in the fifth or sixth week, while the interval is comparatively free (*Weber*).

After a rather rare prodromal stage in the last weeks of pregnancy, consisting of melancholic conditions, but usually without any prodromes, the mood of the puerperal woman becomes somewhat changed. There is a certain irritability and sensitiveness, an antipathy to husband and child, or a strikingly cheerful mood, exaggerated opinion of strength, making of plans, or simple depression, taciturnity, tendency to weep, etc. Sleep grows worse, the appetite is lost, the excitement increases, the ideas begin to grow tumultuous, fantastical and confused, the tendency to motor action becomes more pronounced, and in the fully-developed stage—the outbreak of the maniacal attack—the patients begin to shout and cry, pray or preach aloud, jump from the bed and disrobe. The maniacal seizure lasts for minutes or hours, remissions and exacerbations alternating at irregular intervals. From my experience I cannot confirm the statement that exaggeration and irritation of the sexual sense are found with unusual frequency in these patients. Hallucinations of smell and taste are prominent. The mania may reach such a height that a fatal termination occurs from sudden collapse. It rarely lasts more than three months, when the patient grows more quiet and begins to eat. This is often followed by a certain degree of apathy or emotional depression, and, on the average, convalescence is complete in five to six weeks.

Fuerstner described hallucinatory insanity as a form of insanity peculiar to puerperal women. Characteristic of this is a short prodromal stage, with very variable symptoms, followed suddenly by a perfect storm of symptoms, with brief remissions, and rapidly increasing confusion and violent motor excitability. The second period of the disease is characterized by a stupid, mute condition based upon pathological sensations. The third period is that of convalescence, with more or less rapid disappearance of the hallucinations, passing into a perfectly normal psychical condition.

Puerperal melancholia begins, in the majority of cases, in the late period of childbed. The outbreak of the disease is rarely sudden, its development is slower and its symptoms and course do not differ, on the whole, from those of ordinary melancholia.

The mental disturbances which develop during protracted lactation are simply the result of anæmia, and may also appear in the form of mania or melancholia. The latter is more frequent and is often attended by delusions of a suspicious nature and by a tendency to suicide.

Apart from œdema of the pia mater and serum in the ventricles, anæmia and hyperæmia of the brain, autopsies have furnished as few data as in other forms of insanity for the explanation of the affection; meningitis is found occasionally.

Prognosis.—In very agitated and long-protracted attacks of mania, enormous bedsores often develop, sometimes confine the patient to bed for months, and sometimes prove fatal.

According to Madden's statements, among 1000 patients 688 recovered within six months. Fuerstner says that the majority of puerperal psychoses are cured in six to seven months. In rare cases, the affection becomes chronic, and psychical disturbances remain, which finally pass into dementia. The early occurrence of maniacal conditions is, in general, more favorable than the melancholia with suicidal tendency which develops later. Melancholic conditions late in lactation are usually more unfavorable. Even those patients who have advanced far toward recovery are still very much predisposed to new attacks of mania. Apart from suicide, patients sometimes die at a late period from exhaustion, septicæmia or pyæmia (bedsores).

Treatment.—From a prophylactic standpoint, it is important to prevent profuse vital losses (hemorrhages, diarrhœa, profuse sweats, excessive secretion of milk) in puerperal women, to relieve pain and to secure rest and strength. If it is found that a puerperal woman grows restless and irritable, sensitive and excited, the child must be weaned at once and all exciting factors removed. Only the relatives or husband may share in the watching at night. All objects in the room that attract attention or terrify her must be removed forthwith. If mania develops, a nurse must be present constantly, in order to watch the patient. The nurse secures the proper position and covering for the patient, gives her drinks, urges her to urinate, etc., but enters into no further conversation. The room should be somewhat darkened, because the patients are more easily excited in a bright light. The room and bed should not be too warm.

Sound sleep should be secured by large doses of morphine or chloral, or, better still, by sulfonal (Bayer), 2.0–4.0 gm., given in hot soup. If the disease, nevertheless, develops, speedy removal to a lunatic asylum is indispensable.

CHAPTER V.

Skin Diseases of Puerperal Women.

LITERATURE.

Byrne and Barnes (Purpura puerperalis): *Med. Centralblatt*, 1868, No. 3. Clemens, A.: *Monatsschrift für Geburtskunde*, V, pp. 130–35. M'Clintock: "De la scarlatine puerperale," *L'union médicale*, Oct., 1866. Grenser: *Centralblatt für Gynäkologie*, 1885, IX, 60. Gusserow: "Geburtshülfe und Gynäkologie in Grossbritannien; Reisebericht." *Monatsschrift für Geburtskunde*, XXIV. Hervieux: "De la scarlatine puerpérale," *L'union médicale*, 1867, Nos. 122–127. Hicks, Braxton: London Obstetric. Transactions, XII, pp. 44–113. Hirsch: "Handbuch der historisch-geographischen Pathologie," vol. II, pp. 425–432. Holst: *Petersb. med. Wochenschrift*, 1881, No. 51. Moldenhauer: "Ein Beitrag zur Lehre vom Pemphigus acutus," *Archiv für Gynäkologie*, XVII, Part 3. Olshausen and Mecus: "Ueber acuten contagiösen, afebrilen Pemphigus bei Neugeborenen und Wöchnerinnen, *Archiv für Gynäkologie*, I, 392. Volkmann and Steudener: *Med. Centralblatt*, 1868, pp. 561–563, No. 36.

The acute exanthemata occurring in puerperal women will only be considered in so far as they may give rise to mistakes.

There is no doubt that scarlatina may occur primarily in puerperal women. But its appearance is extremely rare, and those writers who maintain that puerperal women are attacked more frequently by scarlatina than other adults (*Berndt, Sr.*), and that it often occurs epidemically among them (*Malfatti, Eisenman, Hodge*), have had to deal, not with primary scarlatina, but with cutaneous inflammations accompanying septic puerperal diseases. The development of scarlatina by contagion is so undoubted, and the rule that it only attacks human beings once is also so unquestioned, that in such cases among puerperal women who have already had the disease, and in whom contagion can be positively excluded, we must never think of scarlatina, but only of traumatic or symptomatic forms of dermatitis, which have only the color in common with scarlatina.

The *symptoms* of the primary cases are the same as in non-puerperal women. The prodromal stage lasts from a few hours to three days. In the majority of cases the disease begins 1–2 days after delivery; the period of incubation is said to be remarkably short, only 24–48 hours (*Hervieux*). The angina is often inconsiderable; on the other hand, according to A. Martin and Schroeder, diphtheritic endometritis not unfrequently complicates scarlatina. In the majority of autopsies, however, the peritoneum and uterus were found healthy. According to Hervieux, the desquamation takes place more slowly, and is not so pronounced as in scarlatina of non-puerperal individuals. The *prognosis* is always extremely grave; according to the experience of M'Clintock and Halahan, it is absolutely bad. The *treatment* is not modified by the circumstance that the patient is a puerperal woman. There are no specifics. A cool temperature in the room, abundant cool drinks, light covering, frequent change of the bedclothing, lukewarm or cold washings are to be recommended. Halahan gave wine and brandy in enormous doses.

CHAPTER VI.

Sudden Death in Puerperal Women.

LITERATURE.

Ahlfeld: "Berichte und Arbeiten aus Marburg," III, 147. Baart de la Faille: *Monatsschrift für Geburtskunde*, XXV, 318. Barella, "De la mort subite chez les femmes enceintes, en coucher et récemment accouchées, considérée en général, mais particulièrement dans ses rapports avec les maladies organiques du cœur," *Bull. de l'acadêm. de méd. de Belgique*, No. 4, 1873. Cordwent, Geo.: "On Sudden Death by Entrance of Air into Uterine Veins," "St. George's Hosp. Reports," Vol. VI. David (Air embolism): *Lancet*, London, 1883, I, 999. Fairchild (Syncope): *Iowa State Reporter*, Des Moines, 1883–84, I, 49. Frankenhäuser: *Jenaische Zeitschrift*, III, 274. Hecker: *Monatsschrift f. Geburtskunde*, XXIX, 321, and XXXI, 197. Hervieux: *Gazette des hôpitaux*, No. 8, p. 29–31, 1864, and *Gaz. des hôpitaux*, Nov. 28th, 1865. Mackinder: Transact. of the Obstetrical Society of London, Vol. I, p. 213–215. Olshausen: *Monatsschrift f. Geburtskunde*, XXIV, 350–374 (containing the literature on the entrance of air into the uterine veins). Playfair, W. S.: "On Cardiac Apnœa after Delivery," London Obstetr. Transact., 1869, p. 21. Playfair, W. P.: *Brit. Med. Journal*, March 27th, 1869. Ritter: *Monatsschrift*, XXVII, p. 138–142. Salisbury, S.: "Case of Sudden Death Two Hours after Termination of Labor," *Boston Med. and Surg. Journal*, April 24th, 1870. Spiegelberg: *Monatsschrift für Geburtskunde*, XXVIII, 439. Thurstan: *Brit. Med. Jour.*, London, 1883, II, 114. Vysin (Chron. morb. Brightii): *Allgem. Wiener med. Zeitung*, 1883, XXVIII, 85. Warren: *Americ. Jour. Obstetr.*, N. Y., 1884, XVII, 1121. Worley, W. C.: "Case of Sudden Death Ten Days after Labor," *Brit. Med. Jour.*, May 7th, 1870.

One of the most frequent causes of sudden death in childbed is *embolism of the pulmonary artery*, in which the plug completely obliterates the trunk or one of its branches. Such emboli occur after thrombosis of the uterine veins and vessels of the pelvis and thighs. The ordinary symptoms are: Sudden oppression, great fear, considerable dyspnœa, panting respiration; the temperature falls, and the patients die in one or a few hours. Playfair described a case in which abortion occurred eight days after an operation for fissure of the anus, and death took place on the first day of childbed.

There are also cases in which a series of dyspnœal and asthmatic attacks first occur, and, finally, the fatal termination occurs in several days; in Cruveilhier's case, six days after the onset of dyspnœa, oppression, cough, anxiety and enormous frequency of the pulse, auscultation revealing only a few sibilant râles. Ritter has published a case of this kind, in which temperature measurements were made for two and a half days. With a pulse of 102–144, and 30–52 respirations per minute, the temperature, which had previously not been below 99.7° F., fell to 98.2°, 97.7°, 97.1°, and, finally, shortly before death, to 96.4°. The right main branch of the pulmonary artery was completely occluded by a pale red, whitish-yellow, tough plug, which extended into the larger branches as far as they could be followed. The starting-point of the embolus (whether in the veins of the ovary or thigh) was not ascertained with certainty. On the right side anteriorly, particularly at the apex of the lung and from the third intercostal space downward, a somewhat shorter note was heard on percussion than on the left side. The respiratory murmur was distinctly vesicular everywhere; where the percussion sound was shortened, expiration was feeble, while in other parts it could not be heard. The respirations were gasping and very frequent; the patient lay at first as if in a profound syncope; on the other days the lips and tongue were very cyanotic. The patient died sixty-six hours after the occurrence of the embolism.

The causes of the sudden occurrence of embolism are usually exertions (bending, lifting, straining at stool, rapid movements, violent laughter, etc.).

Playfair observed four cases in which all the symptoms of pulmonary embolism developed during childbed, but did not terminate fatally. Coldness of the breath and collapse of the integument (*Martyn*) are not characteristic, and are found also in pulmonary œdema and Bright's disease.

A second, less frequent cause of sudden death in childbed is *the entrance of air into the uterine veins.*

In examinations during labor, in removal of the afterbirth from the vagina, in the introduction of the hand into the uterus in order to separate the placenta, the entrance of air into the uterus is almost unavoidable, and the air in the vagina or uterus sometimes escapes with a loud noise—an audible rumbling. But if the internal os remains firmly closed, the air cannot escape from the uterus, and it is conceivable that on account of the increase of the gases (the air aids putrefaction) the latter are forced into the veins and thus into the circulation. The air in the uterus can also be forced into the uterine vessels when its escape is interfered with or prevented by the contractions of the organ.

When small quantities of air enter the veins, slight symptoms ensue—dyspnœa and unconsciousness. But if there is a rapid entrance of considerable quantities, the patients soon become unconscious and die, with or without convulsions.

The entrance of air may also take place in injections into the uterus, in precipitate labors, with subsequent relaxation of the uterus (*Cordwent*), and in placental detachment. It was stated on page 543 that this accident may occur in uterine carcinoma of parturient women. When the air enters gradually, relatively large amounts may be introduced before death occurs. The cause of death probably consists in the interruption and cessation of the circulation rather than the accumulation of air in the coronary arteries (*Olshausen*).

As a third cause, often, indeed, described but seldom proved, and but infrequently occurring, we may mention *syncope*. It may make its appearance after a severe hemorrhage, or after exhausting loss of vitality due to exertion.

Violent emotional excitement, especially severe pains during labor, have also been mentioned as a cause of sudden death (*Dubreuilh*). Baart de la Faille has collected thirteen cases of post-partum collapse in which neither entrance of air nor embolism was probable, but in which the entire symptom-complex exhibited great similarity to that of *paralysis of the heart*. De la Faille thinks that a reciprocal action between the uterus and pneumogastric is made probable by other pathological facts, although it cannot be explained anatomically. The assumption of cardiac paralysis as a cause of sudden death in parturient and puerperal women certainly has much in its favor.

Still more frequent as a cause of sudden death in childbed than this form of heart failure are *diseases of the heart*, such as valvular lesions, endocarditis, pericarditis, and especially advanced fatty degeneration. In autopsies on some women who had recently been delivered after a difficult labor, Hauber found as the cause of death very acute fatty myocarditis, with interfibrillary deposits of pigment. Acute hemorrhages, especially in placenta prævia, slow abortions, protracted, painful labors, which were terminated too late by the aid of art, furnished the material for these observations.

To this may be added, finally, the extremely interesting case reported by Spiegelberg. A woman died in the Breslau Clinic, on the third day post-partum, from acute myocarditis, with formation of a partial aneurism of the left ventricle and rupture into the pericardial cavity.

PART VIII.

PATHOLOGY AND THERAPEUTICS OF DISEASES OF THE NEWBORN.

The term newborn is applied to a child who still bears traces of his connection with the mother. The child is newborn so long as the remains of the umbilical cord are still present, or the umbilical wound is not yet entirely cicatrized. As the detachment of these remains occurs, as a rule, about the fifth day, and as the cicatrization is rarely finished before the tenth to twelfth day after delivery, we will describe, in this Section, only those anomalies which occur in this first period of extra-uterine life. In hospitals, the entire mortality of children up to the eleventh day is about 10 per cent.; among these, about 2.9 per cent. die before delivery, 1.7 per cent. during delivery, 3.3 per cent. as the result of delivery, and 2.1 per cent. from diseases after birth. In the Munich Clinic we found that the causes in the last class were, in the order of frequency, syphilis (21.6 per cent.), deficient vitality (20 per cent.), disturbances of nutrition (10.1 per cent.), pulmonary atelectasis (8.3 per cent.), jaundice (8.3 per cent.), meningitis (8.3 per cent.), pneumonia (5 per cent.), peritonitis (3.3 per cent.), renal infarctions, (3.3 per cent.), and hemorrhages into the umbilical ring (1.6 per cent.).

CHAPTER I.

Asphyxia of the Newborn.

LITERATURE.

Until 1884 in Runge, M.: "Krankheiten der ersten Lebenstage," Stuttgart, 1885. Fürst: "Ueber Wärmevorrichtungen für zu früh geborene Kinder," *Deutsche med. Wochenschrift*, 1887, XIII, 749. (Therein all the literature is given: Auvard, Credé, Winckel, etc.) Gallois: *Jour. soc. de méd. et pharm. de l'Isère*, Grenoble, 1883–84, VIII, 73. Gee: "Bartholomew's Hosp. Rep.," London, 1884, XX, 16. Gibson: *Amer. Jour. of Obst.*, 1884, p.1 141. McNutt: "Apoplexia neonat.," *Amer. Jour. of Obst.*, 1885, XVIII, 73. Roberts: *Med. Record*, New York, 1886, p. 123. Sharp: *Med. Record*, New York, 1886, p. 10.

Asphyxia is that condition of a newborn child in which the respirations occur at rare intervals or remain entirely absent. This condition develops, intra-uterine, in disturbances of the interchange of gases in the placenta, detachment of the placenta, compression of the funis, compression of th brain, in sudden conditions of weakness or death of the mother.

On pages 375–377 we have discussed in detail the *symptoms* and post-mortem appearances of this asphyxia in the undelivered and newborn child. It only remains for us to add that we distinguish different forms of asphyxia, which were formerly called apoplectic, suffocatory and anæmic, and now are known as the first and second degree of stillbirth. In the first degree the face is cyanotic, the muscular tonus intact, the facial muscles are engaged in respiration, the palate reacts to the inserted finger by movements of deglutition and gagging, and the child reacts to cutaneous irritants. In the second grade this reflex irritability is absent, the child looks pale, at most the lips are somewhat bluish; the limbs hang flaccid; the extremely rare inspirations are attended with pronounced retraction of the insertions of the diaphragm, without implication of the facial muscles. The umbilical cord is flabby and pulseless.

The first degree is similar to that produced by cerebral compression, which, in hemorrhages upon the surface of the brain, causes slowing of the pulse and is often combined with asphyxia, though it may occur alone. Such cerebral compression may be assumed in cases of mild asphyxia, in which, despite vigorous cutaneous irritation, restoration of the child is not possible, but it rapidly becomes somnolent again, and the pulse slower (*M. Runge*). The real cause of the asphyxia is the deficiency of oxygen in the child's blood; this may also result from severe losses of blood, such as occurs in placenta prævia and in rupture of an umbilical vessel in a funis with velamentous (p. 350) insertion. Such cases, however, are quite rare, as the increased cerebral pressure causes slowing of the pulse, and this diminishes the interchange of gases in the placenta; compression of the brain may also aid in the production of asphyxia (*B. S. Schultze*).

The *causes* of asphyxia which act, not during but after the birth of the child, are imperfect development of the child, premature birth, so that neither the muscles nor the nerve centres can effect sufficient excursions of the thorax. Other causes are congenital diseases of the child, such as syphilis of the lungs or liver, ascites, tumors, struma and other congenital tumors. In these children sonorous râles are absent during the short, gasping respirations and the umbilical cord pulsates vigorously; the skin is reddish, the extremities cool; if restored, the children moan; they are unable to nurse, usually lie in a condition of stupor, are apt to become jaundiced and grow constantly colder until death occurs. In autopsies on such cases the signs of premature breathing are hardly ever found, but usually more or less extensive *atelectasis*. The non-aërated parts are dark violet, depressed, sink in water, can be distended, appear perfectly smooth on section, and no gray or greenish mucus can be expressed from them. On account of the friability of the vessels of diseased or prematurely born children, we very often find ecchymoses and small hemorrhages into the different organs, the skin of the presenting parts of the child, the brain, lungs, etc. If they live for a few days, then, in addition to jaundice, œdema is visible on the genitals, wrists and feet, even in other parts of the integument.

The *prognosis* in milder asphyxia, acquired during labor, is usually good, much less favorable in the second degree, and very unfavorable when a hemorrhage has taken place at the base of the brain. A little more than one per cent. of all children who are born alive die from asphyxia. B. S. Schultze has reported two cases in which, after restoration of the deeply asphyxiated children, it was found 1½–2 years later that they were idiotic. To these I may add a case in my own practice, in which a very asphyctic second twin, whom I had restored, at the end of nine months practiced the most violent masturbation on the nurse's lap and in bed; this affection I regard as a symptom of the cerebral lesion experienced during delivery. I remember no other case in which a psychical anomaly resulted in children who were born asphyxiated.

Treatment.—The prophylaxis of asphyxia developing during parturition has been discussed in the different anomalies of labor. The treatment of the *first degree* consists of immediate removal of mucus from the child's mouth, even before the trunk is delivered, immediate ligation of the funis, and vigorous friction and blowing upon or slapping of the nates. The rubbing should be performed upon the back. It is rarely necessary to introduce a catheter below the epiglottis or through the rima glottidis in order to remove inspired particles of mucus.

If these measures are fruitless, it has been advised to place the child alternately in a pail of cold water, up to the neck, and then in a warm bath of 95° F., and again rub the child in warm cloths.

In such cases we have repeatedly employed, with very good results, faradization of the phrenic nerves, according to Pernice's recommendation, but only in the hospital. A venesection of 15.0–20.0 from the umbilical cord is occasionally successful in relieving the heart.

In the *second degree* of asphyxia in which the irritability of the medulla oblongata is very much depressed, B. S. Schultze's method of resuscitation is the best, according to my experience of many years, and I gladly confirm everything that M. Runge has said concerning it (*loc. cit.*, pp. 26–39). The naked child, whose funis has been tied, is grasped from the back with both hands at the nucha, both index fingers below the axillæ, both thumbs over the clavicles, the other fingers on the occiput and back of the neck, and the child is first held straight downward. In order to secure the escape of the inspired fluids from the mouth, pharynx and trachea, the child's trunk is now raised until it falls over from above in the direction of the face, the neck remaining constantly extended; this causes general compression of the thorax, and thus expression of its contents. After a short pause, the trunk is now thrown forward vigorously by the operator and a deep, passive inspiration produced, during which the air often enters the lungs with a whistling noise. After ten to twelve repetitions of this manipulation, the child is placed in a warm bath, and, if respiration is now performed better, the measures recommended for the first degree of asphyxia are continued, perhaps for hours, until the child cries vigorously in a loud voice, moves actively, has a bright red integument, and shows no more traces of stupor. It is true that, after Schultze's method, emphysema of the anterior mediastinal space (*Champneys*, in experiments on dead bodies), small hemorrhages into the suprarenal capsules (*M. Runge*), large hemorrhages into the lungs, with laceration of the pleura (*M. Runge*), fracture of the clavicle and other injuries, have been observed, but only when it has been done roughly. On the other hand, it has been shown that this method acts much more vigorously than all other similar methods of Marshall Hall, Lahs, Sylvester and others; that even in still-born mature children the lungs may be made, by this method, capable of floating, but not in prematurely born children.

When, on the first or second day, the voice of such children again becomes moaning and the integument again cyanotic, warm baths, with cold irrigation of the head, act well. I have no experience concerning the use of hot baths for this purpose.

In asphyxiated children who are diseased or born prematurely, the lungs should first be distended by means of a catheter inserted into the trachea, the children then placed in a bath at 99.5° F., then Schultze's movements performed cautiously four or five times. When the children have finally cried vigorously, they are packed in cotton in Credé's warming tub or placed in Tarnier-Auvard's couveuse or, as I do with striking results in all cases in which there is a suspicion of only slight atelectasis, in the permanent bath-tub devised by me, where they are kept twelve to twenty-four hours or more at a temperature of 98–100° F. In addition, such children must receive sufficient nourishment at the proper temperature every two hours, at first with the spoon, but as soon as possible with a nursing bottle. Diseases of the child that interfere with respiration must be treated as far as possible, constricting clothing must be avoided, and evacuations from the bowels aided by enemata or soap suppositories. In prematurely born children caution must be exercised in the use of cold, and unless they are kept in a couveuse or warm tub or warm bath, the temperature of the room should be kept at 72–75° F.

CHAPTER II.

Cephalhæmatoma.

LITERATURE.

The earlier in M. Runge: S. 207. Bastaki, T.: Spitalul Bucuresci, 1886, VI, 417. Ingersoll (in transverse presentation of the child): Tr. Illinois Med. Soc. Chicago, 1884, XXXIV, 187. Keating: *Arch. Pediatr.*, Philad., 1885, II, 11. McKee (Intracranial): *Med. and Surg. Rep.*, Philad., 1885, LIII, 715. Monnier (In hæmophilia): *Rev. mens. d. mal. de l'enfant*, Paris, 1884, II, 124. Partridge (Intracranial): *Am. Jour. Obst.*, N. Y., 1886, XIX, 497. Pugliatti (double): *Giorn. di clin. et terapia*, Messina, 1884, III, 241. Runge, G. K.: *Centralblatt für Gynäkologie*, X, 476 and 702.

The term cephalhæmatoma is applied to an extravasation of blood between the periosteum and cranial bones. It may occur *externally* or *within* the skull, *i. e.*, between the dura mater and the bones. In the external variety, which we shall first consider, because it is by far the more frequent, the size varies from that of a hazelnut to that of an apple. The shape is round, oval, or like that of a biscuit. They are sometimes formed on several bones, but never overlap a bone, and hence do not communicate. They are most frequent on the parietal bones, in one-sixth of the cases on both, very rare upon the frontal, temporal or occipital bones. At first the extravasation is uniformly tense and resisting, but in a few days the periphery has the shape of a ridge, which soon becomes as hard as bone. The pericranium exhibits small ecchymoses; the ridge is the result of a periosteal inflammatory process, which also produces a gelatinous exudation upon the parts deprived of pericranium. The exudation undergoes ossification, and finally forms delicate strands of bone. A slighter internal cephalhæmatoma is often found, at the same time, beneath the cranial bones. Defects of ossification, fissures, small subepicranial and subaponeurotic hemorrhages are also present occasionally. The extravasated blood is dark, thick, almost like syrup, evidently from the rapid absorption of a part of the serum. As a rule, some blood reaccumulates after evacuation with the knife, even if the latter is not performed until the tenth to twelfth day.

Causes.—The cephalhæmatoma takes its origin in the small subperiosteal hemorrhages which occur in almost every normal labor, and which result from the great fragility of the vessels, the great mobility of the periosteum, the marked hyperæmia of the cranial bones and their displacement and bending during parturition. The torn vessels bleed more strongly in greater traction of the periosteum downward, and the hemorrhage only ceases when the pressure in the blood sac is greater than that in the vessels. The caput succedaneum sometimes corresponds to the cephalhæmatoma, but, on the whole, the latter does not correspond, either as a general thing or in proportion to the vertex presentations, to the previous position of the child (57 on the right side, 35 on the left side, *Hennig*). Moreover, it is found not alone on the presenting, but on the after-coming head, and also in oblique positions of the child (*Ingersoll*). It occurs in 0.5–0.6 per cent. of the children, after easy and difficult labors, can be recognized occasionally during parturition, and is somewhat more frequent in boys than in girls. At first the tumor continues to grow; in a few days it becomes stationary; then the edge of the bone can be felt. It then diminishes and may disappear entirely in about twelve weeks, leaving behind some small irregularities. If intracranial hemorrhages are associated with the external tumor, cerebral symptoms, strabismus, convulsions and death are apt to develop. In rare cases injury causes suppuration or gangrene of the cephalhæmatoma, caries of the bones, even sepsis and meningitis. I have never seen such cases.

Diagnosis.—The distinct fluctuation, the limitation of the tumor to a bone, its gradual increase after birth, the mobility of the thin skin over the tumor, make the recognition of cephalhæmatoma perfectly easy and certain. The tumor is distinguished from an abscess by the absence of redness, heat and pain.

The *prognosis* is good in external cephalhæmatoma, whether single or multiple. Cerebral symptoms speak for internal hemorrhage, and are very grave. Otherwise recovery occurs within two weeks.

Treatment.—While some writers warn against all surgical interference in uncomplicated cephalhæmatoma, and advise that it be left to nature, because they dread suppuration, and have experienced it (*M. Runge*), the author has always, except in very small tumors, incised all tumors of this kind under antiseptic precautions as soon as the stationary period was reached, *i. e.*, on the sixth to eighth day, then made moderate pressure on the detached periosteum with a salicylated cotton dressing, and has healed the children in a few days. He has very rarely seen suppuration, and never lost a child under this plan of treatment. Moreover, it was very rarely necessary to incise the sac again, on account of reaccumulation, because, as a rule, this soon disappears spontaneously. If an abscess forms, it must be incised, the cavity disinfected with 1½ per cent. creolin, and compression exercised in the manner described. The incision should be made 2 cm. long over the lowest part.

CHAPTER III.

Inflammation of the Eyes in the Newborn. Ophthalmo-blennorrhœa Neonatorum.

LITERATURE.

Kaltenbach: *Centralblatt für Gynäkologie*, x, 456. Kehrer: "Beiträge zur Geburtskunde," Vol. II. Leopold and Wessel: *Archiv für Gynäkologie*, XXIV. Magnus and Steffen: Abstract in *Centralblatt für Gynäkologie*, 1885, IX, 219. Smith, E. (Against Credé's method): *Med. Age*, 1885, No. 20. Stratz: *Centralblatt für Gynäkologie*, 1885, IX, 257.

On the second day of extrauterine life we find in the newborn, now and then, a slight redness of the lids, with slight swelling and purulent secretion.

If this affection increases, the very red lids become adherent by purulent secretion, they soon appear œdematous, and between them escapes secretion which is at first like whey, later becomes thick and greenish-yellow. The conjunctiva is velvety, swollen, greatly infiltrated, papillary proliferations appear at the fornix, and thick, longitudinal ridges on the conjunctiva cover the globe. The cornea is soon affected. Epithelial losses first appear in the middle, then opacity, followed by ulceration; next comes perforation with prolapse and adhesion of the iris, and finally phthisis bulbi. In rare cases the conjunctiva exhibits true diphtheritic shreds. After some time (six to eight weeks) the secretion ceases and recovery is complete, unless chronic blennorrhœa is superadded to the acute disease.

Etiology.—The causes of this disease, in the large majority of cases, reside, undoubtedly, in the entrance of *Neisser's gonococci*, which penetrated the conjunctival sac while the child's eyes were still in the maternal genital tract. As a matter of course, the transmission of the virus may also take place after birth, from other affected children, by a dirty mother or unclean nurses, and this probably occurs most frequently in epidemics of this disease. It has not yet been ascertained with certainty whether this blennorrhœa may also be produced by other microörganisms. In one case, in the Dresden Maternity Hospital, a child was born with corneal opacities.

The *prognosis* depends on the degree of the disease, upon the fact whether one or both eyes are affected, upon the period at which the little patient comes under treatment, and upon the exact carrying out of treatment. The earlier this begins the better; recovery in a few days is then usually certain. If the cornea is already affected, there is great danger of blindness.

Treatment.—The first indication is to diminish the danger of infection of the child as much as possible by irrigating the vagina of every pregnant woman suffering from gonorrhœa. Hence every woman approaching term in our wards receives a prophylactic vaginal irrigation of corrosive sublimate (1 : 1000). We must not expect too much, however, from this measure, because, according to Steinschneider's investigations (*vide* page 227), the chief location of the gonococci is the cervix, and not the vagina, and the sublimate injections may not be made into the uterus on account of the danger of infection. Credé advises that every child's eyes be cleansed immediately after birth by instillations of pure water, and that one or two drops of a two-per-cent. solution of nitrate of silver be then dropped upon the cornea with a glass rod, after separating the lids. This prophylactic measure has not been equalled hitherto or excelled. Since then the terrible malady has disappeared from maternity hospitals, and it rarely happens that, after the first instillation, a second or third one must be performed on account of slight secretion and swelling of the lids. The conjunctival reaction to this manipulation usually consists of slight injection, which soon disappears. The nitrate of silver not alone kills the cocci already present, but furnishes the conjunctiva with a protective covering against cocci entering at a later period.

The same effect has not been obtained with carbolic acid or corrosive sublimate. With instillations of corrosive sublimate (0.02 per cent.) Stratz (*loc. cit.*) found a morbidity of 0.43 per cent; with nitrate of silver Leopold found only 0.03 per cent. Kaltenbach thinks that the same effects are obtained by sublimate disinfection of the vagina and irrigation of the eyes with pure water, and dreads the conjunctival catarrh produced by nitrate of silver. But the number of his cases is still too small.

If a fully developed blennorrhœa comes under treatment, the first thing to be done is to wash out the secretion. If only one eye is affected, the other must be excluded by a dressing of salicylated cotton, gauze and collodion, and this must be renewed daily. Then instillations of a 2 per cent. solution of nitrate of silver must be made into the affected eye, and the swelling and pain relieved by ice compresses. In the most severe cases, cauterization of both lids with the mitigated stick, followed by washing with salt water and cold compresses, is advisable. Formerly I had to employ this treatment very often, but not once in the last eight years. If keratitis is present, a ½ per cent. of atropine or eserine must be dropped into the eye.

CHAPTER IV.

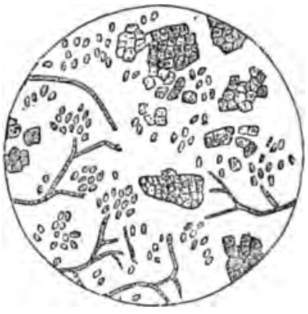
Fungi of the Newborn. Sprue. Aphthophyta.

LITERATURE.

Biedert-Vogel: "Lehrbuch," IX Aufl. 1887, p. 76. Klemperer: "Ueber den Soorpilz," I. D., Berlin, 1886. Stumpf: *Münchener med. Wochenschrift*, 1887. Wolff: *Archiv für Gynäkologie*, XXIV.

In artificially-nourished infants, those who receive sugar-teats or sugar, and those nursed by women whose children have suffered from sprue, an affection of the mouth often develops in the shape of small, cheese-white patches, at first isolated on the tongue, then upon the lips and gums, and finally confluent over the entire buccal mucous membrane. These patches are surrounded by reddened mucous membrane, can be readily scraped off, and contain the sprue fungus, saccharomyces albicans (*Rees*), discovered in 1839 by Langenbeck. This fungus prefers substances containing acid, starch and sugar. In nitrogen-containing gelatin which is free from sugar, it grows in the shape of mycelium threads; upon potatoes and sugar-containing nutrient substances it forms serrations and chains of yeast cells. The darkly-colored mycelium threads exhibit at the ends or on the links oval spores, gonidia (Fig. 187). It is found among the superficial pavement epithelium of the mouth, pharynx and œsophagus, rarely in the stomach. It may also penetrate through the mucous membrane into the vessels and produce emboli in various places.

FIG. 187.



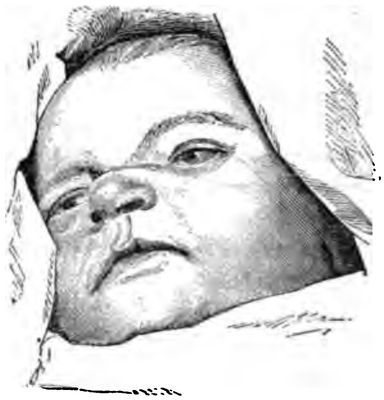
Sprue Fungi from the Buccal Cavity. Segmentation of the Threads. Gonidium on the left, at the end of a mycelium.

The *symptoms* of this affection are pain on nursing, very acid reaction of the mucous membrane, dryness and heat of the mouth, hoarseness. The fungus may cause an injurious fermentation of the food, and thus impair nutrition. Diarrhœa sets in, the evacuations are acid. But the gastric and intestinal catarrhs which are found so often in sprue are usually not the result of the latter, but of the underlying cause of both, viz., improper nourishment and uncleanliness.

The *diagnosis* is made easily by inspection, but should be confirmed by the microscope. In mild cases the disease only lasts a week, in severe ones much longer and exhibits frequent exacerbations; in marasmic children it lasts until death.

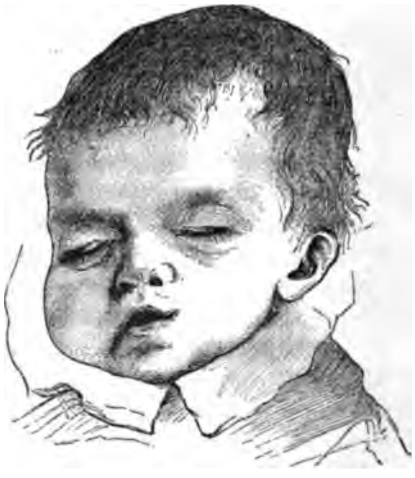
Treatment.—After many trials of nitrate of silver, chlorate of potash, corrosive sublimate, benzoate of soda, after long-continued washings and brushings, which are always painful, the writer has returned to the borax treatment, which is used with the best results in solutions of 1–3 : 30

FIG. 188.



Congenital Cicatrix of the Upper Lip on Left Side; Cured Hare-lip.

FIG. 189.



Congenital Hypertrophy of the Skin of the Right Cheek.

syrupus florum Rhœados. It should not be applied with a brush, but by giving ½ teaspoonful of the solution 1–3 times a day. The patients take the fluid eagerly, and bring it, by means of the tongue, much more thoroughly in contact with the recesses of the mouth than we can with the brush. The disease is surely relieved in 3–4 days. A few of the children have slight diarrhœa, but this disappears spontaneously. In severe cases I begin at once with a 10 per cent. solution.

As an appendix, I will refer to two rare congenital anomalies observed by me, mention of which is wanting in the well-known text-books. In Fig. 188 is a left-sided hare-lip, cured in utero; the cut shows the cicatrix and indentation of the lip very well. Fig. 189 shows a congenital hypertrophy of the integument of the right cheek.

CHAPTER V.

Inflammation of the Breast. Mastitis Neonatorum.

LITERATURE.

Billroth: "Krankheiten der Brustdrüse," II Aufl., 1886.

The breasts of the newborn commonly form extremely slight, flat prominences on the chest or none at all, but they may also swell to the size of a walnut and become painful. This occurs with equal frequency in boys and girls. A fluid like colostrum can then be expressed from them (see p. 72). It contains casein, albumin, sugar, salts, fat and colostrum corpuscles; this is furnished by the cells of the still tubular infantile glands with their terminal bulbs. Suppuration occurs in very rare cases, and the pus perforates. Even gangrene, phlegmon and sepsis may develop in very neglected cases. The writer has never observed these terminations. Perhaps some flat or retracted nipples depend upon such inflammatory processes. There is hardly any doubt that the disease is due to the entrance of inflammation-producers which are, perhaps, already present in the vagina. The affection is usually relieved in a short time by the application of cotton, vaseline, borax ointment, and, if an abscess forms, speedy incision, irrigations of ½-per-cent. solution of creolin and a light compress and bandage.

CHAPTER VI.

Umbilical Diseases of the Newborn.

LITERATURE.

Babanasjantz, S.: I. D., Petersburg. *Centralblatt für Gynäkologie*, IX, 25, 1885. Broussolle, E. (Vegetations of the navel): *Rev. mens. d. mal. de l'enfant*, Paris, 1886, IV, 314. Fürst: "Die Nabelerkrankungen," *Wiener Klinik*, 1884, Parts 11 and 12. Gilbert: "Abscess durch Fremdkörper," *Presse méd. Belge*, Brux., 1887, XXXIX, 265. Gilroy, J.: *Lancet*, I, 621, London, 1888. Hirigoyen: *L'abeille méd.*, 1883, No. 30. Holt, L. E.: "Umbilical Tumor in an Infant, formed by Prolapse of the Intestinal Mucous Membrane of Meckel's Diverticulum," *Med. Record*, N. Y., 1888, XXXIII, 431. Ingram, J. (Umbilical hemorrhage): *Louisville Med. News*, 1884, XVIII, 131. Lindfors: *Nordisk med. Arkiv*, XV, 25, 1883. Reuter (Umbilical hemorrhage): *Centralblatt für Gynäkologie*, XI, 164, 1887. Smith, J. L.: "Thrombosis of Umbilical Vein; Acute Diffuse Peritonitis," *Amer. Jour. Obst.*, N. Y., 1884, XVII, 545. Steenken, Chr.: "Die angeborenen Nabelgeschwülste," Würzburg, 1886, I. D.

In the perfectly normal state of the remains of the umbilical cord, its exfoliation takes place with hardly any inflammation. It gradually dries from the cut end in twelve hours, and is converted into a flat, mummified cord, in which the vessels, particularly the vein, are visible as a narrow black band. At the penetrating part of the cord there is seen a very slightly reddened fringe, above which that part of the amnion which is situated below first appears eroded; gradually, the gelatinous matter disappears, as if it were absorbed. Finally, the vessels form their connecting threads and are strongly retracted from adhesion of the intima, together with occasional formation of small thrombi in the arteries. Then the last thin vascular threads break on the fourth to fifth day (74–144 hours), and there remains at the base of the umbilicus a very small, hardly moist surface, which is covered by the upper and lower folds of the skin (*M. Runge*, *Babanasjantz*, etc.).

1. If this normal process is altered by the entrance of any injurious element, we find not alone the border of the skin reddened, swollen and inflamed, and the adherent remains of the funis moist and brownish-black, but a suppuration, which requires great care, is situated in the umbilical ring. The very best remedies, according to our experience, are frequent washing with a 3-per-cent. solution of boracic acid and dusting with salicylic acid and starch (1 : 3 to 1 : 1). The skin must be separated thoroughly in order that the powder may be carried by a brush into the depths of the wound.

2. After the exfoliation of the remains of the umbilical cord, granulations, the so-called *fungus umbilicalis*, sometimes develop. These proliferate like a strawberry from the umbilical ring and form true granulomata, consisting of round cells and intercellular substance. They very rarely contain smooth muscular fibres and tubular glands (adenomata). These are the remains of

the allantois according to Huettenbrenner, of the umbilical vesicle according to Kolaczek.

These tumors are removed by cauterization with nitrate of silver or fuming nitric acid, or they are ligated with juniper catgut, excised, and the wound covered with a dressing of salicylated cotton.

Virchow (*Archiv*, XXXI, 128) found a congenital spindle-cell sarcoma, four inches long, protruding from the umbilical ring.

3. *Inflammations of the Umbilical Ring.*—The most frequent affection is *erysipelas*, starting from the umbilical wound, and due to infection with streptococcus (*Fehleisen*). It extends rapidly over the surface of the body and covers it completely. The children usually die in convulsions, with high temperature, a few recover after weeks of illness. The disease has been observed epidemically outside of maternity hospitals (*Demiéville*).

The erysipelas may terminate in *phlegmon* and *gangrene* of the abdominal walls, the skin becoming infiltrated and livid, with greatly distended vessels, partly downward toward the genitalia, partly upward or around the umbilicus. If gangrene sets in, vesicles form upon the skin, which becomes discolored and gangrenous, and death may occur from peritonitis or sepsis. The local treatment consists of strict antisepsis with thymol, boracic or carbolic acid, baths and dusting with powdered salicylic acid, incisions as soon as fluctuation is felt, and removal of gangrenous parts with the scissors. Internally, we should give wine in teaspoonful doses with nourishing fluids, bouillon, meat juice, yolk of egg. The writer has never observed these most severe forms of inflammation of the umbilical ring. What has been termed puerperal fever of the newborn usually belongs under numbers 3 and 4.

4. *Diseases of the Umbilical Vessels. Umbilical Arteritis and Phlebitis.*—The infectious matter passes from the umbilical wound into the connective tissue, the arteries and vein, then attacks the adventitia, muscularis and intima, and produces a thrombus (secondary), which finally breaks down. The vessels appear thickened, surrounded by gelatinous infiltrated connective tissue; usually both arteries are affected, more rarely one, most markedly at the umbilicus and as far as the bladder. If the remains of the end are already exfoliated, we can sometimes squeeze plugs of pus from the gaping end of the arteries. The intima is cloudy, irregular, nodulated. The umbilical ring may be ulcerated, but arteritis is found occasionally when the umbilical wound has healed favorably. According to Weber and M. Runge, the periarteritis is always primary. According to M. Runge, the retroperitoneal connective tissue and iliac arteries always escape, others have found them implicated. In two-fifths of the cases of arteritis Runge found pneumonia, either lobar or in the form of small metastatic abscesses associated with pleurisy. Peritonitis, swelling and softening of the kidneys, liver and spleen may occur; also, erysipelas and joint affections; in short, all forms of pyæmia, including mild and grave jaundice.

In umbilical phlebitis we also find gelatinous œdema of the adventitia of the vein, swelling and infiltration of the muscularis, and the intima cloudy, thickened, nodular, as if eroded. The virus enters either around the vessels into Glisson's capsule, where it produces extensive infiltration, or it reaches the liver through the umbilical vein and its branches. Thence it passes through the head to the lungs and other organs of the body. The pericardium, pleura, bones and joints then manifest pyæmic disease.

At first the *symptoms* are not very striking; they usually develop during the first week. The umbilical ring appears reddened, the skin is swollen along the course of the diseased vessels as far as the pubes or ribs. The children are feverish and restless, keep the legs drawn up on the abdomen, and soon become jaundiced, in arteritis as well as in phlebitis. Death generally occurs in convulsions, but recovery has also been observed.

Treatment.—The prophylactic treatment consists in the proper management of the stump of the umbilical cord and the subsequent wound, the total removal of any suppuration that may be present. Afterward, warm bathing, wine, and quinine are to be tried. At most, the remedies are all palliative, not curative.

5. *Umbilical Hemorrhage.*—Hemorrhages from the umbilical vessels occur partly from imperfect ligature, partly from partial gangrene of the remains of the cord, and fragility of the vessels. Fresh ligature, with a firm bandage and, if the cause is to be found in diseases of the umbilicus or asphyxia of the children, removal of these anomalies, will tend to check the hemorrhages. Much more dangerous are hemorrhages from the umbilical wound, from the edge as well as the base. These kill by the rapid anæmia, with secondary hemorrhages from the stomach and intestines, jaundice, cyanosis and œdema, in almost four-fifths of all cases. The causes are to be sought partly in syphilis, partly in septic infection, partly in hæmophilia, partly in acute fatty degeneration and hæmoglobinuria. Among the last five thousand children born in the Munich Clinic, the disease only occurred once. The *treatment*, unfortunately, is usually unavailing. We may try compression with cotton and liquor ferri sesquichloridi. Ligature of the entire umbilical ring, according to Dubois' plan, has also been tried without avail (*Hirigoyen*). Hill advised plugging of the umbilical fossa with paste of plaster-of-Paris. Digital compression and collodion compress and bandage are often useless. Even when the hemorrhage is finally checked, the children often die later from the loss of blood.

6. *Hernia of the Umbilical Cord, Congenital Omphalocele.*—It has been said that only congenital umbilical hernias, in which a portion of the liver appears in the fissure of the abdominal walls, is capable of spontaneous and operative recovery (*Biedert-Vogel*), inasmuch as the peritoneal covering of the liver becomes covered with granulations, the opening gradually becomes smaller and a firm cicatrix develops. This has been disproved by the expe-

rience of Lindfors. If the hernia can be reduced, the abdominal walls should be drawn together from behind by means of strips of adhesive plaster; if their coaptation is possible, operative relief of the affection is indicated. After Lindfors, reduction by simple compression and percutaneous ligature have also been employed successfully. This writer completely cured, in ten days, an umbilical hernia (as large as a child's head, and containing only loops of intestines) by introducing two rows of sutures, after reduction of the intestines and removal of the sac. Felsenreich and four other surgeons have also operated successfully (*Wien. med. Presse*, 1883).

Umbilical hernia does not develop until a few weeks after birth, and therefore will not be discussed here.

CHAPTER VII.

Jaundice. Icterus Neonatorum.

LITERATURE.

Ashby: *Med. Chronicle*, October, 1884, I, No. 1. Birch-Hirschfeld: *Virchow's Archiv*, LXXXVII, 1, 1882. Halberstam: I. D., Dorpat, 1886. *Centralblatt f. Gynäkologie*, 1886, X, 811. Hofmeier: *Zeitschrift für Geburtshülfe und Gynäkologie*, VIII, Part 2. Quincke: *Archiv f. experim. Pathologie*, XIX. Raudnitz: *Prager med. Wochenschrift*, 1884, No. 11.

Physiological icterus of the newborn appears during the first three or four days of life upon the face and chest, without any special disturbance of the general condition. It disappears in about eight days. But if the child is as yellow as an orange, and the conjunctiva, abdomen and limbs are affected, then, as a rule, a general disease is present, and, whether septic or otherwise in character, makes the jaundice appear as a serious symptom. The urine is then dark and contains bile pigment, the stools are bile-stained, occasionally bloody.

Etiology.—Feeble, prematurely born children, or those who have suffered, for any reason, traction or pressure on the funis during labor, are chiefly predisposed to jaundice. According to the explanation of Birch-Hirschfeld, in which I agree entirely, it is in such cases that the swelling of Glisson's capsule, which starts from the umbilical vein, and, on account of the œdema, interferes with the outflow from the bile ducts, is the cause of the jaundice, and the latter is therefore hepatogenous. Birch-Hirschfeld found biliary acids in the pericardial fluid, and accordingly demonstrated the direct connection of the jaundice with the hepatic secretion. This was corroborated by Halberstam (*loc. cit.*). On the other hand, Hofmeier attributes physiological icterus to an enormous destruction of the red blood-globules, which excites a considerable increase in the production of bile in the liver, the main organ for the destruction of red blood-globules. The escape of the bile, or its passage into the blood, will be facilitated by congestion and succulence of the duodenal mucous membrane and congenital narrowing of the ductus choledochus.

Quincke assumes, as the cause of the jaundice, patency of the ductus venosus Arantii, which carries the bile that has been absorbed from the meconium directly into the circulation. Noteworthy are Ashby's cases, in which several children of one family died in succession, of jaundice, on the ninth to eleventh days, with symptoms similar to those of acute yellow atrophy of the liver.

According to Halberstam, the urine of children whose conjunctiva is icteric contains undissolved bile pigment in the shape of diffuse infiltration of the epithelium or casts, or as shapeless masses of a golden-yellow color.

Mild jaundice requires merely regulation of the diet: not too much nor too fatty food, keeping the child warm and securing easy evacuations (enemata). Grave jaundice is only a symptom, whose treatment depends upon the primary disease.

CHAPTER VIII.

Lockjaw. Trismus and Tetanus Neonatorum.

LITERATURE.

Beumer: *Berliner klin. Wochenschrift*, 1887, No. 30. Holt, L. E. (Tetanus cured by potassium bromide): *Boston Med. and Surg. Jour.*, 1883, Oct. 18th. Peiper: *Centralblatt für klin. Medicin*, 1887, No. 42.

Lockjaw and general spasm of the newborn is undoubtedly a surgical tetanus, which probably starts from the umbilicus in all cases and is produced by tetanus bacilli. After the umbilical cord has dropped off, *i. e.*, as early as the first week of extra-uterine life, the children first manifest a certain restlessness and tremor of the lower jaw; soon the mouth appears compressed, the lips folded; it is impossible to open the mouth; the muscles of mastication are very tense. Now general spasm, opisthotonos, develops, and after repeated attacks at longer or shorter intervals, with a rise of temperature to 109.4° F., the children die of suffocation or exhaustion.

As is best shown by the epidemic occurrence of the disease, the spasms are due to a virus, tetanin, which has entered the umbilical ring (*Brieger*), and Beumer and Peiper have demonstrated clinically and experimentally the identity of trismus and tetanus neonatorum with inoculation or surgical tetanus. The fatality of the disease is enormous, and only a few cases have recovered. We must attempt to nourish the patient as long as possible by enemata of beef-juice with peptone, introduced through the elastic catheter. Potassium bromide (0.05 gm. at a dose), atropine and eserine (0.000025 gm.), curare (0.00005 gm.) and chloral hydrate (0.01–0.3 gm.) have been given subcutaneously, per rectum or internally, and chloroform by inhalation, but it has generally been useless to attempt to master the disease.

CHAPTER IX.

Acute Fatty Degeneration of the Newborn. Buhl's Disease.

LITERATURE.

Hecker und von Buhl: "Klinik der Geburtskunde," 1, 296.

In 1861 Buhl observed a marked fatty degeneration of the liver cells, heart muscle, pulmonary alveoli, renal epithelium and intestinal villi in children who were born asphyxiated and soon died, and in others who lived for a few days after symptoms consisting of cyanosis, vomiting, icterus, hemorrhages from the umbilicus and intestines, hemorrhages into the brain, lungs, pericardium and peritoneum. The children were well nourished, and usually died after the second week. Buhl explained the disease as an acute resolution of the cell juices into fat and an albumin derivative, or as the second stage of a parenchymatous inflammation, an acute fatty degeneration. The hemorrhages he attributed to the fluidity of the blood, the cyanosis (which is due to the myocarditis), and to the acute Bright's disease with œdema. Poisoning with phosphorus and arsenic were excluded. Whether the disease is curable is a matter of doubt.

CHAPTER X.

Acute Hæmoglobinuria of the Newborn.

LITERATURE.

Sandner: *Münchener medicinische Wochenschrift*, 1886, No. 24, 421; containing the entire literature. Winckel: Verhandlungen der Gesellschaft für Heilkunde in Berlin. II öffentliche Versammlung der pädiatr. Section, April, 24, 25, 1879.

In the spring of 1879 the writer witnessed in twenty-three children, an endemic hæmoglobinuria of the newborn, associated with cyanosis, jaundice and hemorrhages from different organs. A fatal termination occurred, on the average, in thirty-two hours. Swelling of Peyer's patches and the mesenteric glands, blackish-red coloration of the renal pyramids with dark hæmoglobin streaks, fatty degeneration of the liver and other organs were the most important post-mortem findings. The jaundice is hæmatogenous, due to the transformation of the hæmoglobin into bilirubin. At that time Gerhardt called this affection Winckel's disease, although Bigelow, Epstein, Herz and others had described isolated cases of this kind, but had not furnished the proof of hæmoglobinuria. The most recent sporadic case, described by Dr. Sandner, furnishes the proof that it is a new disease of the blood, hæmoglobinæmia. All possibilities of poisoning with chlorate of potash, carbolic acid, phosphorus, arsenic, etc., are positively excluded. The virus which produces the disease is still unknown. The mothers of the affected children showed no infection; most of the children were vigorous, even very strong; nineteen out of twenty-three succumbed. It is to be hoped that the germs of this disease will be discovered. I still remember with terror the endemic, for which each colleague had a different explanation, although the suspicion of poisoning, which had long been disproven, was the first to arise. I rejoice that since then I have witnessed no similar epidemic.

CHAPTER XI.

Hardening of the Cellular Tissue. Sclerema Neonatorum.

LITERATURE.

Bouttier, E.: Thèse de Paris, 1886, No. 38. Hildebrand: *Monatsschrift für prakt. Dermatol.*, Hamburg, 1886, V. 202. Nielsen: *Hosp. Tidende*, Kjobenh., 1887, 3 R. V., 553. Porteous, J. L.: *Edin. Med. Journ.*, 1887–88, XXXIII, 225. Soltmann: *Breslauer ärztl. Zeitschr.*, 1883, V. 57.

Prematurely born, feeble and poorly nourished children are attacked not infrequently by a brawny œdema, at first, as a rule, in the lower limbs, calves, feet, thighs and trunk, with the exception of the chest. This œdema, at first often pale and compressible, later hard and shining, finally attacks the head and face. The children manifest extremely slight vitality. All the secretions are diminished, hence the temperature is very low, the pulse slow, respiration feeble, the voice moaning, diuresis slight. Death occurs usually with the escape of bloody serum from the mouth and nose, without convulsions. Pneumonia and syphilis are sometimes found in these cases; diseases of the heart and fatty degeneration of the organs are also regarded as causes. The œdema appears post-mortem as a firm gelatinous infiltration of the connective tissue situated above the aponeuroses, not of the intermuscular tissue. The prognosis is usually bad.

Treatment.—Hot, permanent baths, hot packs, massage from the periphery toward the centre (*Soltmann*), nutritious food and wine may be tried. The placing of the children in warming-tubs or in Auvard's couveuse, so that the inspired air may be very moist and warm, is also advisable.

CHAPTER XII.

The Black Disease. Melæna Neonatorum.

LITERATURE.

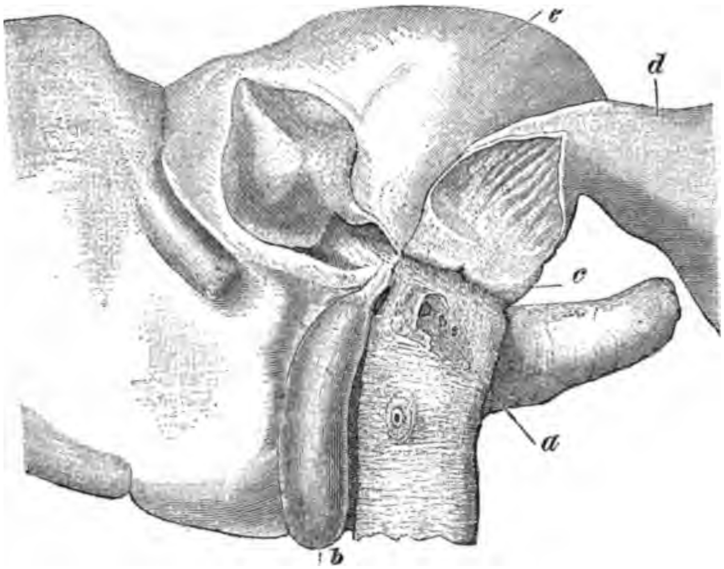
Anders: I. D., Greifswald, 1885. Epstein: *Allgem. Wiener med. Zeitung*, 1882, Nr. 49. Landau: "Ueber Melæna neonatorum." Breslau, 1874. Nieberding: Würzb. physik.-med. Gesellschaft, 1886, Mai 8. Schmid: *Med. Correspondenzblatt der württemb. ärztl. Vereine.* Stuttgart, 1884, LIV, 193. Silbermann: *Jahrbuch der Kinderheilkunde*, XI, 1877. von Zezschwitz: *Münchener med. Wochenschrift*, 1888, Nr. 30.

Profuse gastro-intestinal hemorrhages, especially in the newborn, have been called melæna since the time of Hippocrates. This is true melæna as distinguished from the so-called false melæna, in which the blood was merely swallowed, either in the maternal internal genitalia or from the nipple. Autopsies on children who have died of this disease sometimes furnish no anatomical explanation; in a few cases a duodenal ulcer was found (*Schmid* and my case, *Zezschwitz*) (*vide* Fig. 190). Landau regards melæna as embolism of the gastric and duodenal vessels, resulting from thrombosis of the umbilical vein. *Nieberding* did not find the latter lesion, but noted persistence of the ductus art. Botalli, while the arch of the aorta was very narrow before its entrance. The overloading of the arterial system extended to the mesenteric arteries and intestinal capillaries. The disease has also been brought in connection with hæmophilia (*Lederer*). In one case, which was described by Zezschwitz, there was no embolism of the duodenal vessels; the duodenal ulcer was found close to the pylorus. The muscular coat of the duodenum was very thick, the stomach considerably dilated, and it seemed as if, under the stimulus of the aspirated amniotic fluid, mixed with vaginal secretion, increased secretion from the gastric mucous membrane had taken place. This had peptonized a piece of the intestinal mucous membrane, which, according to Kundrat, is greatly congested at the beginning of respiration, especially in asphyxiated children.

In a few cases, one of which was recently under our observation, hæmatemesis with bloody stools occurs in the first few days after birth. In others there are only bloody evacuations from the bowels (Zezschwitz's case). The children are restless, moan, become anæmic with surprising rapidity. The discharged blood is either fluid or coagulated, bright red or dark. The skin grows cool, the pulse imperceptible, and half the children die in one to three days. The *prognosis* is extremely grave. The last case under my observation terminated favorably. This child was nursed by the mother (summer of 1888).

Treatment.—We may attempt to combat the hemorrhage with ice or high temperatures, also with strong styptics. In our first case the ice-bag and ice-water enemata were of no avail. Hot packs, hot baths, hot bottles placed alongside the child (*A. Vogel*) should be tried. Internally, we may give liquor ferri sesquichlor. (1.2 : 15 aq. destil., with syr. simpl. and aq. cinnamom. āā), 1 teaspoonful every hour or two. Astringent remedies will probably reach the bleeding spot more surely from the stomach than from the rectum. We might also try to restrain the hemorrhage in such cases by moderately firm compression of the entire abdomen with a bandage. After the hemorrhage is checked the anæmia must be treated.

FIG. 190.



Duodenal ulcer (*a*) in melæna neonatorum. *b*. Gall-bladder. *c*. Pylorus. *d*. Stomach. *e*. Liver. Child born Jan. 11th, 1888, died Jan. 13th, 1888.

INDEX.

- Abdomen, examination of, in pregnancy, 98
    - changes in, in pregnancy, 71
    - fœtal, faulty conditions of, 436
- Abdominal pregnancy, 272
    - laparotomy in, 720
- Abdomino-uterine incision, 722
- Abdomino-vaginal section, 728
- Aborifacients, 298
- Abortion, 292
    - artificial separation of placenta in, 731
    - pathology, 292
    - symptoms, 293
    - definition, 293
    - diagnosis, 297
    - etiology, 297
    - duration, 299
    - prognosis, 299
    - treatment, 299
        - preventive, 299
        - when threatened, 300
        - when inevitable, 300
    - consequences, 302
    - induction of, 614
    - history, 614
    - among ancients, 614
    - definition, 615
    - indications for, 615
    - justifiable indications, 617
- Accouchement forcé, 735
- Acetone, in urine, 207
    - in expired air of eclampsia, 590
- Acute diseases, induction, premature labor in, 622
- Acute hæmoglobinuria of newborn, Winckel's disease, 898
- Adherent placenta, 573
    - diagnosis, 574
    - pathology, 575
    - treatment, 731
- Adhesion of os uteri in labor, 547
- After-coming head, extraction of, 687
    - various methods, 687, 688, 689
    - forceps to, 708
    - perforation of, 661
- Albuminuria, in labor, 153
    - indication for abortion, 616
- Allantois, 39
- Amnion, 39
    - in twins, 117
- Amniotome, 344
- Amniotic adhesions, 310
- Amputation, of fœtus, spontaneous, 360
    - of arm in version, 653
- Anæmia, of pregnancy, 261
    - symptoms, 261
    - treatment, 261
- Anæsthesia, in obstetric examination, 106
    - in labor, 186
- Anasarca, induction of premature labor in, 622
- Anatomy and physiology of pregnancy, 33
- Animal bladder, in induced labor, 627
- Anteflexion of pregnant uterus, 241
- Anteversion of pregnant uterus, 241
- Ante-displacement of gravid uterus, 241
    - pathology, 241
    - symptoms, 242
    - etiology, 243
    - treatment, 244
- Antifebrine, for temperature in labor, 585
- Antisepsis, efficacy of, in puerperal fever, 852
    - in labor, 125
- Anvil-shaped uterus, 527
- Anxiety, effect on osteomalacia, 482
- Aorta, pulse of, in pregnancy, 89
    - rupture of, in labor, 600
- Aortic aneurism, fœtal, 439
- Arms, over head in breech cases, 684, 685
- Artificial removal of placenta, 731
- Articulations of pelvis—
    - complete rupture of, 870
        - causes, 870
        - symptoms, 870
        - treatment, 871
    - affections of in puerperium, 868
        - pathology, 869
        - symptoms, 869
        - diagnosis, 869
        - etiology, 869
        - prognosis, 870
        - treatment, 870
- Artificial foods, for child, 218
    - choice, 229
    - preparation of, 220–222
- Artificial dilatation of os uteri, 634
    - methods, 634
    - indications, 635
    - operation, 635
- Ascites, fœtal, 438
    - induction of premature labor in, 622

Asphyxia neonatorum, 883
  definition, 883
  symptoms, 884
  degrees, 884
  causes, 884
  prognosis, 885
  treatment, 885
Aspiration of uterus—
  to induce abortion, 618
  in retroversion during pregnancy, 240
Aspiration of bladder—
  in retroversion during pregnancy, 248
Atonia uteri, 504
Atresia of os in labor, 547
Attitude,
  faulty, of fœtus, 380
    definition, 380
    frequency, 381
    etiology, 383
    symptoms, 384
    diagnosis, 386
    prognosis, 386
    treatment, 387
  faulty, as cause of prolapsed cord, 369
  of fœtus, normal, causes, 84
Auscultatory signs of pregnancy, 88
  blowing sounds, 89
  crepitating sounds, 89
  cry of child, 92
  friction sounds, 89
  fœtal heart sounds, 89
  intestinal sounds, 89
  heart sounds of mother, 89
  movements of child, 92
  murmur in inferior epigastric artery, 89
  pulse of aorta, 89
  sucking sounds, 92
  uterine bruit, 88
  umbilical souffle, 90
  vesicular murmur, 89
Auscultation, in pregnancy, 99
Axis of pelvis, 141

Barnes' method, in placenta prævia, 327
  bags in placenta prævia, 324
Basilysis, 663
Basiotripsy, 663
Basiotribe, Tarnier's, 665
Basilyst, Simpson's, 665
Baudelocque's method in face presentation, 656
  diameter, 101
Black disease, of newborn, 900
    pathology, 900
    causes, 900
    symptoms, 901
    prognosis, 901
    treatment, 901
Bladder—
  aspiration of in retroversion, 240
  changes in during pregnancy, 74
Bladder—
  diseases of in puerperium, 865
    symptoms, 866
    diagnosis, 866
    causes, 866
    treatment, 867
  fœtal, distention of, 437
    prognosis, 439
    treatment, 440
Blastodermic membrane, 37
Blennorrhœa, in pregnancy, 227
Blood, changes in, during pregnancy, 201
"Blood moles," 296
Blowing sounds, in pregnancy, 89
Blunt hook, in, impacted shoulder, 680
Bone forceps, 715
  Mesnard's, 713
Bone, pelvic, sections of, 480
Brain, diseases of, producing dystocia, 582
  embryonic, 47, 48, 49
Braun's navel-string repositor, 675
Breasts—
  areola, 46
  changes during pregnancy, 44, 72
    value, 108
  changes during puerperium, 201
  diseases of, 854
  sebaceous glands, 46
  secretion of, 49
  irritation of, for inducing abortion, 631
  inflammation of, 857
Breus' forceps, 704
    in pelvic deformity, 500
Breech presentation, 171
  prolapse of cord in, 676
  (see pelvic presentation.)
Brow presentation, 392
    mechanism, 392
    causes, 391
    symptoms, 391
    diagnosis, 394
    prognosis, 395
    treatment, 396
  correction of, 655
    conditions, 655
    history, 655
    operations for, 656
Bronchocele in fœtus, 431
Bruit, uterine, 88

Cadaverin in puerperal fever, 848
Cæsarean section, 722
    history, 722
    indications, 723
    time to operate, 723
    operation, 723
    after-treatment, 726
    prognosis, 726
    in atresia and adhesion of external os, 549
    in carcinoma of uterus, 546

- Cæsarean section in pelvic deformity, 500
  - in uterine myomata, 540
- Caoutchouc bags, in induced labor, 629
- Cancer of uterus, indication for abortion, 617
- Caput succedaneum,
  - in vertex presentation, 157
  - in face presentation, 164
  - in pelvic deformity, 487
- Catheterization of uterus, for inducing labor, 627
- Cardiac diseases, in pregnancy, 263
  - varieties, 263
  - etiology, 264
  - treatment, 264
- Carcinoma uteri, 542
  - general remarks, 542
  - prognosis, 544
  - treatment, 545
  - as disturbance of labor, 542
- Carcinoma in sacral region of fœtus, 444
- Carbonic acid douche, for inducing labor. 631
- Cells, of decidua, 41
  - "daughter," 40
- Cephalotripsy, 663
  - history, 664
  - instruments, 664
  - object, 666
  - indications, 666
  - conditions necessary, 666
  - operation, 666
  - prognosis, 667
- Cephalotriptor, or cephalothryptor, 664
- Cephaloclast, 664
- Cephalotribe, 664
  - Breisky's, 665
  - Breisky-Jakesch, 665
  - in pelvic deformity, 502
- Cephalhæmatoma, in newborn, 887
  - definition, 887
  - causes, 887
  - diagnosis, 888
  - prognosis, 888
  - treatment, 888
- Cervical endometritis as cause of premature rupture of membranes, 339
- Cervical ganglion in labor, 130
- Cervix, changes of, in pregnancy, 44
  - dilatation of, in induced labor, 628
  - examination of, in pregnancy, 103
- Child,
  - care of, after birth, 194
  - changes in, after birth, 212
  - diameters of head, 51
  - fontanelles, 51, 52
  - fully developed, 51
  - position in utero, 85–88
  - size of, 112–114
  - sutures of, 51
  - weight of, 51
- Chloroform, in labor, 187
  - in eclampsia, 596
- Chloral hydrate,
  - in eclampsia, 596
  - in labor, 188
  - in precipitate labor, 520
- Chorion, 61
  - diseases of, 302
- Chorion frondosum, 39
- Chordæ tendinæ of Hyrtl, 54
- Chorea during pregnancy, 269
- Climate, effect on osteomalacia, 481
- Circulation, in fœtus, 66
- Circulatory organs, diseases of, in labor, 581
- Clitoris, embryonic, 46
- Clothing, effect on osteomalacia, 482
- Cocaine, in labor, 188
  - in precipitate labor, 520
- Coccygeal gland, hyperplasias of, in fœtus, 444
- Cohen-Credé method in placenta prævia, 327
- Cohabitation, effect on ovule, 34
- Colpitis, in puerperium, 784
- Colostrum, 73, 201
  - composition, 201
- Colpeurynter, in induced abortion, 618
  - in placenta prævia, 324
  - in rigidity of soft parts, 551
  - in weak pains, 511
  - in induced labor, 627
- Commissures, vaginal, examination of, in pregnancy, 103
- Coma (eclampsia), 587
- Conjugata, diagonalis, 101
  - externa, 101
  - vera, 101
- Congenital goitre, 432
- Constipation in pregnancy, 81
- Contraction ring, 70
- Contracted pelvis,
  - induced abortion in, 617
  - induced labor in, 621
- Contractions of uterus,
  - transitory, 86
  - corrective, 86
- Convulsions (eclampsia) 587
  - forceps in, 697
- Cooper's scissors, in rigidity of soft parts, 551
- Cord, umbilical,
  - about neck of child, 185
  - ligature of in labor, 186
  - prolapse of in labor, 366
  - prolapse of in placenta prævia, 320
- Corpus luteum, changes in, 44
- Cramps in nursing women, 863
  - symptoms, 864
  - treatment, 864
- Cranioclast,
  - Auvard's, 714
  - Braun's, 713
  - Auvard's large, 715
  - application of, 714

Cranioclast, extraction with, 714
Cranioclasis, 712
    results of, 715
Craniopagus monster, 455
Credé's method for placental delivery, 192
Crests of ilia, distance between, 101
Crural hernia, 579
Cry of child in utero, 92
Cystic hygroma, 430
    of neck, 430
Cystocele of vagina in labor, 554

Death of parturient, delivery after, 599
    sudden, in puerperium, 879
        causes, 879
        symptoms, 880
Decapitation, 668
    indications, 668
    conditions necessary, 668
    operation, 668
    results of, 669
Decidua, cervical, 70
    circumflexa, 41
        formation, 41
        structure, 41
    serotina, 41
    menstrualis, 41
    vera, 56
        ampullary layer, 61
        atrophy of, 291
        cysts of, 292
        apoplexy of, 292
        abortion, 292
        former theory of, 41
        present theory of, 41
        structure of, 41–46
        formation of, 41
        pathology of, 60
Deformed pelves, induced abortion in, 615, 616
Delivery after death of mother, 599
Depression of puerperal uterus, 751
Development of embryo by stages, 38
Diameters, fœtal, cephalic, perpendicular, 53
        transverse, long, 53
        transverse, short, 53
        occipito-frontal, 53
        long oblique, 53
        short oblique, 53
        straight, 53
        bi-parietal, 53
        vertical, 53
        sub-occipito-bregmatic, 53
        occipito-mental, 53
        bitemporal, 53
    of pelvis, 139
Diagnosis, primipara and multipara, 112
Diaphragm, changes in pregnancy, 75
Diet, effect on osteomalacia, 482
    of puerperium, 214
Dicephalus dibrachius monster, 452
Diprosopus monster, 451
Diseases of pregnancy, 126–128
        treatment, 126–128
    of fœtus, induction of premature labor in, 622
Dorsal position, for operating,
        advantages, 607
        disadvantages, 607
Dorsal laminæ, 38
Double manipulation in version, 651
D'Outrepont's indirect version, 642
Douche, uterine, for inducing labor, 630
    vaginal, in weak pains, 511
Drugs, effect of, on milk, 215
Ductus arteriosus Botalli,
        narrowing of, as cause of labor, 131
Ductus omphalo-mesentericus, 37
Ductus venosus Arantii, 131
Dwellings, effect on osteomalacia, 481
Dwarf pelvis, 465
Dysuria in pregnancy, 81
Dyspnœa, induction of premature labor in, 622
Dynamometer, 695

Ecchymoses of nipple, 854
Eclampsia, 587
        definition, 587
        etiology, 588
        symptoms, 592
        cause of labor in, 594
        diagnosis, 594
        prognosis, 595
        treatment, 595
    indication for abortion, 616
    induction of premature labor in, 622
Ectoderm, 37
Eczema of nipple, 854
Electricity, for inducing labor, 630
    in extra-uterine pregnancy, 285
    in weak pains, 514
Embryo, development of, 45–50
    formation of, 39
    metabolism in, 65
    nutrition of, 65
    measurements of, 45, 46
    at fourth week, 37
    at fifth and eighth week, 45
Embryonic spot, 38
Emetics, in weak pains, 512
Endometrium, inflammation of, in puerperium, 784
        pathology, 785
        symptoms, 785
        etiology, 786
        prognosis, 786
        treatment, 787
Endoderm, 37
Endometritis, gonorrhœal, during pregnancy, 227

Endometritis, gonorrhœal, symptoms, 227
        diagnosis, 228
        treatment, 229
    in puerperium, 784
    membranæ deciduæ veræ, 288
    polyposa, 290
Enterocele of vagina in labor, 555
Enlarged thorax, fœtal, 433
        diagnosis, 434
        prognosis, 434
        treatment, 435
Epiblast, 61
Epigastic artery, inferior, murmur in, 89
Epilepsy during pregnancy, 269
Episiotomy, 632
    object, 632
    indications, 633
    first performed, 632
    instruments, 633
    operation, 633
Ergot, for induced labor, 623
    in weak pains, 512
Erysipelas of breasts, 857
        pathology, 857
        symptoms, 587
        treatment, 857
    external and internal in puerperium, 832
        pathology, 832
        treatment, 840
Erythema papillarum of nipple, 854
Ethyl bromide in labor, 187
Evisceration, 669
    indications, 669
    instruments, 669
    operation, 670
Examination, obstetric, 97
        external, 97
        breasts, 97
        inspection, 97
        palpation, 98
        percussion, 99
        auscultation, 99
        pelvic diameters, 101
        pelvic circumferences, 101
        internal, 102
        rectal, 104
        urine, 106
Expressio fœtus, 677
        history, 677
        object, 677
        conditions necessary, 677
        indications, 678
        operation, 678
Expression of head, 679
Expelling forces, 133
        uterine, 133
        premonitory pains, 135
        preparatory pains, 135
        expulsive pains, 135
        shivering pains, 135
        after-pains, 135
Expelling forces, effect on temperature, pulse, respiration, 135
        abdominal muscles, 137
        perineal muscles, 137
Extra-uterine pregnancy, 272
        definition, 272
        pathology, 272
    ovarian pregnancy, 273
    tubal pregnancy, 274
    abdominal pregnancy, 276
        symptoms, 279
        etiology, 281
        diagnosis, 282
        prognosis, 285
        treatment, 285
    laparotomy in, 719
External genitals, changes in pregnancy, 44
        inflammations of, in puerperium, 781
            pathology, 782
            etiology, 783
            symptoms, 782
            prognosis, 783
            treatment, 784
        lacerations of, in labor, 743
External os uteri,
    atresia, adhesion of, in labor, 547
Extraction, after eventration, 717
    by shoulders, 679
    by breech, 682
        object, 682
        operation, 684
        arms extended, treatment, 685
        disengaging arms, 685
    by feet, 681
        history, 681
        conditions necessary, 681
        indications, 681
        operation, 681
    of decapitated trunk, 716
    of head separated from trunk, 716
    of after-coming head, 689, 690
    with sharp hook, 716
Extremities, prolapse of, in labor, 381
Eyes, affections of, during pregnancy, 267
    embryonic, 45
Eyelids, embryonic, 46, 47, 48

Face presentation, 161
        history, 161
        definition, 162
        diagnosis, 163
        first face position, 164
            diagnosis, 164
            mechanism, 164
        second face position, 164
            diagnosis, 164
        etiology, 164
        prognosis, 174
        correction of, in labor, 655
            conditions necessary, 655

Face presentation, correction of, history, 655
        operations, 656
    faulty mechanism in, 393
        causes, 391
        symptoms, 391
        diagnosis, 394
        prognosis, 395
        treatment, 396
    forceps in, 703
    management of, 185
    prolapse of cord in, 676
    version in, 651
Falciform fold of placenta, 60
Fallopian tubes in pregnancy, 71
Fatty degeneration of new-born, 898
  (Buhl's disease.)
Fecal masses, an obstruction to labor, 578
Fecundation,
  conditions necessary for, 34
  cohabitation, 34
  Graafian vesicle, bursting of, 34
  His' theory of, 36
  ovule; size of, 35
    passes through isthmus tubæ, 35
    exit of, 34
    loses power of conception, 34
  possibilities of, 35·
  Sigismund's theory of, 36
  uterus, participation of, 34
  vagina, participation of, 34
  spermatozoa, meet ovule, 35
    rate of movement, 35
  spermatic fluid, 34
Fever during labor, 584
Fibromata in sacral region of fœtus, 443
Fissures of nipples, 854
Fœtal head,
    sutures of, 142
    fontanelles of, 142
    forms of, 143
    characteristics of, 142
Fœtal heart sounds, 89
    indications for forceps, 697
    value as sign of pregnancy, 109
Fœtal membranes, development of, 45–50
Fœtus, at third month, 46
  at fourth month, 47
  at fifth month, 47
  at sixth month, 48
  at seventh month, 49
  at eighth month, 49
  at ninth month, 49
  at tenth month, 50
  abnormal condition of abdomen of, 438
    causes, 438
    prognosis, 439
    treatment, 440
  abnormal condition of thorax of, 433
    diagnosis, 433
    prognosis, 434
    treatment, 435
  blood of, 67
Fœtus, circulation of, 66
  cystic hygroma of, 430
  death of, 329
    causes in placenta, 329
    causes in cord, 330
    syphilis in father, 331
    kidney and heart disease, 331
    diseases of fœtus, 331
    symptoms of, 332
    diagnosis, 333
    treatment, 333
  determination of size of, 112
  eventration of, 440
  faulty attitude of, 380
    etiology, 380
    symptoms, 384
    diagnosis, 386
    prognosis, 386
    treatment, 387
  faulty mechanism of, 390
  faulty presentations of, 397
  faulty positions of, 390
  movements, value as sign of pregnancy, 109
  meconium of, 66
  metabolism of, 65
  nutrition of, 41
        in early life, 41
    old and new theories, 41, 42
  palpation of, value as sign of pregnancy, 108
  papyraceus, 116
  several in uterus, 446
    mechanism of labor, 447
    treatment, 450
  spontaneous amputation of, 360
  size and weight at 3d month, 46
    at 4th month, 47
    at 5th month, 47
    at 6th month, 47
    at 7th month, 47
    at 8th month, 49
    at 9th month, 49
    at 10th month, 50
  temperature of,
  tumors in sacral region of, 442
    varieties, 443
    course of labor, 445
    treatment, 446
  unusual motions of, caused by disease, 331
Fontanelles, of fœtal head, 51, 52
  anterior, 51
  false, 51
  lateral, 52
  posterior, 51
Foot presentation, diagnosis of, 172
Foramen ovale, narrowing of, as cause of labor, 131
Forceps, 393
  history, 693
  description, 694

- Forceps, qualifications, 694
  - locks, 694
  - actions, 695
  - conditions necessary, 696
  - indications, 697
  - operations, 699
    - vertex positions, 699
    - face positions, 703
    - occipito-posterior, 703
  - adaptation of, 699
  - application of, in prolapse of cord, 378
  - axis-traction, 704
  - Breus', 704
  - dangers of, 709
  - in Dresden clinic, results of, 711
  - in Munich clinic, results of, 711
  - in pelvic deformity, 499
  - in weak pains, 514
  - Simpson's, 704
  - Tarnier's, 704
- Forces, abdominal muscles, 137
  - faulty conditions of, 503
  - uterine, 133
    - characteristics of, 135
    - stages of, 134
- Forcible delivery, 735
- Fracture of ilium, cause of pelvic deformity, 477
- Friction sounds in pregnancy, 89
- Fungi in vagina, 226
- Funiculus umbilicalis, 54
- Funnel-shaped pelvis, 475

- Galactorrhœa, 863
- Gastro-elytrotomy, 729
- Genitals, action during labor, 133–153
  - affections of, in pregnancy, 226
  - changes in pregnancy, 67–74
    - value, 107
  - changes in puerperium, 197
  - disinfection of,
    - in labor, 125
    - in operations, 612
    - in puerperium, 215
  - hemorrhage from,
    - in labor, 575
    - in puerperium, 759
  - lacerations of,
    - in labor, 556, 738
    - in forceps operations, 709
  - of fully-developed child, 51
  - preparation of, for labor, 125
  - protection of, in labor, 183
  - secretion from,
    - in diseases of ovum, 288
    - in obstetric examination, 102
    - in puerperium (see lochia)
  - stenosis of, in labor, 547
  - wounds of, in puerperium, 738
- Germinal spot, 36
  - vesicle, 36
- Germinal vesicle, bursting of, 34
  - elevation of Hensen, 38
- Gingivitis during pregnancy, 251
- Glands, sebaceous, of breast, 46
  - uterine, changes in pregnancy, 39
- Goitre in fœtus, 431
- Gonococcus, appearances, 227
  - in puerperal fever, 849

- Habitual oblique positions, 406
- Hæmatomata,
  - of pelvis in labor, 556
  - of uterus in puerperium, 777
  - of vulva, 771
  - of vagina, 771
- Hæmatocele, retro-uterine, in labor, 553
- Hæmatoidin, 44
- Hallucinatory insanity in puerperium, 874
- Hand, choice of, in version, 646
- Head, fœtal,
    - circumferences of, 53
    - faulty conditions of, 419
    - injuries to, in deformed pelves, 489, 490
    - measurements of, 45–48
- Heart, fœtal,
    - auscultation of, 99
    - changes in, during labor, 147
    - changes in, during pregnancy, 89
    - sounds first heard, 48
  - maternal,
    - changes during pregnancy, 75
    - sounds conveyed in pregnancy, 89
- Hemi-paresis uteri, 504
- Hemorrhage, external, in puerperium, 759
    - location, 760
    - etiology, 761
    - symptoms, 763
    - diagnosis, 765
    - prognosis, 766
    - treatment, 767
  - forceps in, 697
  - from premature detachment of placenta, 329
  - internal, in puerperium, uterine, 777
    - pathology, 778
    - symptoms, 778
    - diagnosis, 779
    - etiology, 779
    - prognosis, 780
    - treatment, 780
  - internal, in puerperium, vulval, vaginal 771
    - pathology, 772
    - symptoms, 773
    - diagnosis, 774
    - etiology, 774
    - prognosis, 775
    - treatment, 776
  - in third stage, 575
    - causes, 575

- Hemorrhage in third stage, treatment, 576
  - in labor, cause of, 148
  - late in puerperium, 770
  - of nipple, 854
- Hernia, umbilical, of fœtus, 441
  - dorsal, in fœtus, 442
  - incarcerated inguinal, indication for abortion, 616
  - of gravid uterus, indication for abortion, 616
  - of intestines, .
  - of pregnant uterus,
    - cases on record, 244
    - etiology, 245
    - diagnosis, 247
    - prognosis, 247
    - treatment, 247
  - uteri bicornis, 527
- Herpes areolæ papillæ of nipple, 854
- History, obstetric, 95
- Hofmeier's method for expression of head, 679
- Hook, double, 716
- Hot bath in eclampsia, 595
- Hydatiform, or vesicular mole, 303
  - pathology, 303
  - symptoms, 304
  - diagnosis, 305
  - etiology, 305
  - prognosis, 305
  - treatment, 305
- Hydatid cysts of pelvis, 552
- Hydramnios, excess of liquor amnii, 306
  - definition, 306
  - symptoms, 307
  - diagnosis, 307
  - etiology, 307
  - prognosis, 309
  - treatment, 309
  - as cause of oblique positions, 405
  - as cause of prolapse of cord, 370
  - induction of premature labor in, 623
- Hydrothorax, fœtal, obstruction to labor, 434
- Hydrocephalus, 419
  - definition, 419
  - pathology, 420
  - frequency, 421
  - ascites with, 421
  - presentation of fœtus in, 422
  - course of labor in, 422
  - artificial assistance in, 423
  - diagnosis, 424
  - prognosis, 425
  - treatment, 425
- Hydrorrhœa of pregnant uterus, 288
  - pathology, 288
  - symptoms, 289
  - diagnosis, 290
  - etiology, 290
  - prognosis, 290
  - treatment, 290
- Hydrencephalocele, 427
- Hydromeningocele, 427
- Hyperdynamia uteri, 515
- Hypertrophy of glandular organs in pregnancy, 83
  - cause of, 85
- Hysterocele, 244

- Icterus neonatorum, 896
    - symptoms, 896
    - treatment, 897
  - gravidarum, 255
    - treatment, 257
  - gravis gravidarum, 256
- Immature labor, artificial separation of placenta in, 731
  - treatment of, 333
- Impregnation, how accomplished, 36
- Incontinence of urine during pregnancy, 81
- Inclination of pelvis, 138
- Incisions in rigidity of soft parts, 551
- Incomplete flexion of head, as obstruction to labor, 391
- Induced current in labor, 189
  - labor in placenta prævia, 323
    - in eclampsia, 596
  - premature labor, 619
    - history, 620
    - indications, 621
    - prognosis, 623
    - preparation, 623
    - methods, 623
      - puncture of membranes, 623
      - separation of membranes, 623
      - dilatation of vagina, 624
      - dilatation of cervix, 624
      - thermic irritation, 624
      - chemical irritation, 624
      - electrical irritation, 624
- Induced abortion, 614
  - dangers, 617
  - colpeurynter in, 618
  - history, 614
  - indications, 616, 617
  - in pelvic deformity, 502
  - operation, 618
- Inertia uteri, 504
- Infected midwives, 851
- Inguinal hernia, 579
  - in puerperium, 215
  - instruments for, 630, 733
- Injections, vaginal, in labor, 183
  - uterine, for inducing labor, 626
- Injuries to pregnant women, 334
- Insanity, puerperal, 874
  - hallucinatory, 874
  - (mania, see mania.)
  - (melancholia, see mania.)
    - symptoms, 874
    - treatment, 875
    - causes, 875
- Insertio furcata, of umbilical cord, 55

- Intestines, changes in during pregnancy, 75
  - changes in during puerperium, 207
  - sounds in during pregnancy, 89
- Intra-fœtatio capitis, 429
- Intra-fœtatio abdominalis, 440
- Intra-fœtationes sacrales, 444
- Introduction, historical, 17
- Internal os, in pregnacy, 46–50
- Introitus vaginæ, incision of, in labor, 632
- Inversion of uterus, 751
  - pathology, 752
  - symptoms, 753
  - diagnosis, 754
  - etiology, 755
  - prognosis, 757
  - treatment, 757
  - of rectum, in labor, 579
- Irrigation tubes, vaginal, uterine, 733
- Ischiopagus monster, 453

- Janiceps monster, 455
- Jaundice in the newborn, 896
  - in pregnant woman, 255, 256
- Jelly of Wharton, 47
  - composition, 54
- Justo minor pelvis, 465

- Kephalothoracopagus monster, 451
- " Kidney of pregnancy," 75
  - in twin pregnancies, 120
- Kidneys, changes in during pregnancy, 74, 75
  - erysipelas of, section, 837
  - fœtal, enlargement of, 437
    - prognosis, 439
    - treatment, 44.
    - maternal, tumors of in labor, 580
  - weight of embryonic, 50
- Knee-elbow position, 608
  - advantages, 609
  - disadvantages, 609
  - in prolapse of cord, 378
- Kyestein, 77

- Labia majora and minora, changes in pregnancy, 46
- Labor, antiseptic preparation for, 125
  - anterior vaginal ganglion in, 131
  - calculation of date of, 113
  - causes of, 131
  - central influences in, 131
  - cervical ganglion in, 130
  - disturbances due to
    - intestines, 578
    - kidneys, 580
    - spleen, 580
    - liver, 580
    - aorta, 580
    - excessive vomiting, 581
  - duration of stages, 151
  - fœtal heart sounds in, 147
- Labor, force of, calculation, 135
  - lactation, effect on osteomalacia, 482
  - membranes in, 145
  - mechanism, normal, 153
  - management, 177
  - obstacles to overcome, 138
  - pathology and therapeutics, 337
  - *Membranes* :—immature and premature rupture of, 337
    - excessive resistance of, 343
  - *Umbilical cord* :—faulty form and vascular arrangement of, 346
    - abnormal insertion of, 346
    - abnormal length of, 352
    - knots of, 352
    - too short, 354
    - shortening by coiling, 356
    - lesions of during labor, 360
    - parenchymatous changes in, 364
    - new growths of, 365
    - presentation and prolapse of, 366
  - *Fœtus* :—
    - faulty attitude of, 380
    - faulty position of, 390
    - faulty mechanism of, 390
      - in vertex presentation, 390
      - in brow presentation, 390
      - in face presentation, 390
    - faulty presentation of, 397
    - hydrocephalus, 419
    - hydromeningocele, 427
    - hydrencephalocele, 427
    - intra-fœtatio capitis, 427
    - cystic hygroma, 430
    - faulty conditions of thorax, 433
    - faulty conditions of abdomen, 436
    - tumors of sacral region, 442
    - several fœtuses in utero, 446
    - double monstrosities, 450
  - *Pelvis* :—
    - pelvic deformity, 457
  - *Forces* :—
    - weak labor pains, 503
    - too strong pains, 515
    - precipitate labor, 515
    - spasmodic pains, 521
  - *Uterus and vagina* :—
    - uterus bicornis, 531
    - muscular neoplasms of uterus, 533
    - carcinoma of uterus, 542
    - atresia and adhesion of external os uteri, 547
    - stenoses, rigidity and swelling of soft parts, 549
    - neoplasms of vagina, 551
    - retro-uterine hæmatocele, 553
    - cystocele vaginalis, 554
    - vesical calculi, 554
    - vaginal enterocele, 555
    - hæmatocele, 556
    - rupture of the uterus, 557
    - retained placenta, 570

Labor—*Non-sexual organs:—*
    intestines, 578
    kidneys, 580
    spleen, 580
    liver, 580
    aorta, 581, 600
    excessive vomiting, 581
    circulatory organs, 581
    brain and cord, 582
  Temperature during labor, 584
    eclampsia, 586
  Sudden death during labor, 597
    delivery after death of mother, 599
  peripheral influences, 131
  phenomena, 144
  physiology and management of, 129
    definition—motor nerve centre of uterus—causes of, 129
    the expelling forces, 133
    obstacles to be overcome, 138
    phenomena—stages of labor, 144
    mechanism—different presentations—course in vertex presentations, 153
    abnormal mechanism in vertex presentation, 158
    face presentation, 161
    pelvic presentation—breech—knee—foot, 169
    prognosis of the different presentations, 174
    labor in multiple pregnancy, 176
    management of labor—general directions, 177
    management of labor—special directions, 188
    anæsthetics in labor, 186
    treatment of the third stage, 189
    management of twin labors, 194
    care of the child, 194
  placental separation, 150
  posture in, 181
  stages, 144
    dilatation, 144
    expulsion, 145
    placental expulsion, 149
  sudden death during, 597
  temperature in, 152
  temperature, abnormal in, 585
  urine, changes in, 53
Lamina dorsales, 38
Lanugo, 47
Laparotomy, indications for, 718
  in extra-uterine pregnancy, 287, 719
  in puerperal peritonitis, 807
  in rupture of the uterus, 721
Laparo-colpotomy, 729
Laparo-hysterotomy, 722
  in eclampsia, 597
Laughing gas in labor, 188
Lateral position of parturient, 607
    advantages, 607
Lateral position of parturient, disadvantages, 608
  prone position, 608
    forceps in, 706
  quarter-version, 652
Lead-water, in diseases of nipples, 856
  in mastitis, 860
  in phlegmasia dolens, 831
Lebedeff, method for Cæsarean section, 725
Leptotrix vaginalis, 226
Ligamentum recto-vesicale, 531
Linea alba, changes in during pregnancy, 72
Liquor amnii, 62
    composition, 61
    excess of, hydramnios, 306
    functions, 64
    origin, 64
    small amount of, 310
    urea in, 65
    usual quantity of, 49
Liquor ferri sesquichloridi in ulcers of vulva and vagina, 746, 784
Lithopædion, 278, 296
Lithokelyphopædion, 276
Lithokelyphos, 276
Liver, affections of, in pregnancy, 255
  changes in during pregnancy, 75
  embryonic, 47, 48
  fœtal, tumors of, 436
    prognosis, 439
    treatment, 440
  rupture of, in fœtus during extractions, 687
  section, puerperal erysipelas of, 837
  tumors of maternal, in labor, 580
Lobular mastitis, 858
Lochia, 200
  alba, 200
  composition, 200
  cruenta, 200
  putrid, 800
  serosa, 200
  varieties, 200
Lockjaw, trismus and tetanus neonatorum, 897
  causes, 897
  treatment, 898
Locks, of forceps, 694
  junctura per contabulationem, 694
    per axin, 694
    mixta, 694
Longings during pregnancy, 82
Lower uterine segment, 70
Lungs, changes in during pregnancy, 75
  erysipelas of, in puerperium, 838
Lymphatics, changes in during pregnancy, 69

Management of pregnancy, 123
    nourishment, 123
    clothing, 123

- Management of pregnancy, occupation, 124
    - care of skin, 124
    - care of genitals, 124
    - care of breasts, 124
    - exercise, 125
    - sleep, 125
  - of labor, 177
    - anæsthetics, 186
    - general directions, 177
    - special directions, 180
    - third stage, 189
    - twin labors, 194
  - of newborn child, 194
  - of puerperal woman, 213
  - of child in puerperium, 218
- Mania, puerperal, 874
    - varieties, 874
    - causes, 855
    - symptoms, 876
    - prognosis, 877
    - treatment, 877
- Manikin, practice on, 603
- Mastitis neonatorum, 892
    - symptoms, 892
    - treatment, 892
- Mastitis, perimastitis, 857
    - pathology, 857
    - symptoms, 857
    - treatment, 858
  - parenchymatous and lobular, 858
    - pathology, 858
    - symptoms, 859
    - etiology, 859
    - treatment, 860
- Massage of uterus in weak pains, 513
- Mauriceau's method (see Veit-Smellie's, 689)
- Measles during pregnancy, 259
- Mechanism of labor, 153
    - in vertex presentation, 155
      - normal, 155
      - abnormal, 158
    - in face presentation, 161
    - in pelvic presentation, 169
    - in knee, foot presentation, 169
    - in incomplete flexion of head, 390
    - in brow presentation, 392
    - in mento-posterior, 390
    - in occipito-posterior position, 390
    - in oblique positions, 407
    - in shoulder presentation, 407
- Meconium, 46–49
- Melæna neonatorum, 900
- Melancholia, in puerperium, 874
- Membranes, action of, in labor, 144
  - artificial rupture of, in precipitate labor, 520
  - blastodermic, 37
  - diseases of, 288
    - endometritis membranæ deciduæ veræ, 288
    - endometritis polyposa, 290
    - atrophy of decidua vera, 291
- Membranes, diseases of, cysts of decidua vera, 292
    - apoplexy of decidua vera, 292
    - hydatiform mole of chorion, 302
  - excessive resistance of, 343
      - etiology, 343
      - diagnosis, 344
      - treatment, 344
  - fœtal, sections of, 60, 61
  - immature and premature rupture of, 337
      - definition, 337
      - etiology, 337
      - symptoms, 340
      - effect on labor, 341
      - prolapse of extremities in, 341
      - in deformed pelves, 339
      - effect on child, 342
      - dangers, 343
      - treatment, 343
- Membrana limitans, 62
- Membranes of ovum, 39–44
  - puncture of, for inducing labor, 624
  - separation of, for inducing labor, 623
- Meningitis, during labor, 582
  - symptoms, 582
  - course of labor, 582
- Menses, cessation of, in pregnancy, 107
- Menstruation, return of, after labor, 209
- Mensuration in diagnosis of pregnancy, 100
- Mercury in puerperal peritonitis, 807
- Mesnard's forceps, 713
- Mesoderm, 37
- Metrorrhagia as indication for abortion, 616
- Methyl chloride, as anæsthetic in labor, 611
- Metastatic pyæmia in puerperium, 811
- Metroscope, 88
- Metritis in puerperium, 787
  - (parametritis, phlegmone, pelvis)
    - pathology, 788
    - symptoms, 790
    - diagnosis, 791
    - etiology, 792
    - prognosis, 793
    - treatment, 793
- Metallic dilators in induced labor, 628
- Micturition, frequent, in pregnancy, 81
- Michælis' method in prolapse of cord, 379
- Microbes in puerperal fever, 848
- Milk, anomalies in secretion of, 861
  - complete absence of, 861
  - too slight a secretion, 861
    - etiology, 862
    - symptoms, 862
    - treatment, 862
  - enormous amount of, 863
  - polygalactia, galactorrhœa, 863
    - symptoms, 863
    - etiology, 863
    - treatment, 864
  - composition, 202
- "Milk fever," so called, 204
- Mind, disorders of, during pregnancy, 268

- Missed labor, 296
- Monstrosities as cause of oblique positions, 404
  - classification, 451
  - diagnosis of, 454
  - double, as disturbances of labor, 450
    - double head and one trunk, or one trunk, 451
    - two heads and one trunk, 452
      - diagnosis, 452
      - treatment, 452
    - two heads on two trunks, 453
      - mechanism, 453
    - one head on two trunks, 455
    - three heads, 455
  - prognosis, 455
- Morphine, in eclampsia, 596
  - injections of, in extra-uterine pregnancy, 286
- Morning sickness, 81, 127
  - causes, 81
  - treatment, 127
- Morula, 37
- Movements, fœtal, 47, 48, 92
  - examination for, 99
  - first felt by mother, 48
  - instinctive, 85
  - sounds of, 92
- Mulberry body, 37
- Multiple labor, 446
  - disturbances due to, 446
  - double monstrosities, 450
  - faulty mechanism with twins, 446
  - interlacing and knotting of cord, 448
- Multiple pregnancy, 144
  - as cause of prolapse of cord, 369
  - amnion in, 117
  - causes of, 115
  - frequency of, 144
  - development of ovum, 116–118
  - labor in, 176
  - placentæ in, 116
  - manner of impregnation, 114
  - super-fecundation, 115
  - symptoms and signs of, 120–122
  - super-fœtation, 115
  - triplets, 119
  - umbilical vessels in, 117
  - quadruplets, 119
  - quintuplets, 119
- Multipara, diagnosis of, 112
- Müller's modified Porro operation, 728
- Murmur, arterial in pregnancy, 89
  - venous, in pregnancy, 89
  - uterine, 48
  - uterine vascular, 89
  - vesicular, respiratory in pregnancy, 89
- Myomata of uterus, 535
  - as cause of oblique positions, 403
  - diagnosis, 539
  - labor with, 536
- Myomata of uterus, prognosis, 539
  - treatment, 540
  - with symptoms of retroversion, 238
- Myxoma of chorion, 303
  - indication for induced abortion, 617

- Nails, embryonic, 50
- Nausea in pregnancy,
  - cause of, 82
  - treatment, 127
- Neck, fœtal, faulty conditions of, 429
- Neglected oblique positions,
  - version in, 651
- Neoplasms of vagina, as obstacles to labor, 551
- Nervous system, affections of, in pregnancy, 268
- Nerves,
  - changes in during pregnancy, 69
  - motor, of uterus, 130
- Neuralgias in pregnancy, 83
  - cause of, 83
  - in puerperium, 871
    - pathology, 871
    - symptoms, 872
    - treatment, 872
- Newborn child,
  - bathing of, 218
  - care of, 195
  - clothing, 218
  - changes in cord, 211
  - changes in circulation, 211
  - icterus in, 213
  - meconium, 213
  - nourishment of, 218
  - pathology and therapeutics of, 883
    - asphyxia, 883
    - cephalhæmatoma, 887
    - inflammation of eyes, 888
    - fungi of—sprue, 890
    - inflammation of the breasts, 892
    - umbilical diseases, 893
    - jaundice, 896
    - trismus and tetanus, 897
    - fatty degeneration—Buhl's disease, 898
    - hæmoglobinuria — Winckel's disease, 898
    - sclerome, 899
    - black disease—melæna neonatorum, 900
  - physiology and management of, 211–222
    - temperature of, 212
    - urine, 212
    - weight of, 212
- Nipples, changes in, during pregnancy, 72
  - diseases of, in puerperium, 854
    - *Varieties :—*
      - erythema papillarum, 854

- Nipples, diseases of—*Varieties:*—
    - phlegmon, 854
    - eczema rhagades papillarum, 854
    - fissures, 854
    - ulcers, 854
    - ecchymoses, 854
    - hemorrhages, 854
    - herpes, 854
  - *symptoms*, 855
  - *etiology*, 855
  - *prognosis*, 856
  - *treatment*, 856
  - irritation of, for inducing labor, 631
- Nitrous oxide in labor, 188
- Nodi, gelatinosi, in cord, 55
  - varicosi, in cord, 54
- Nutrition of fœtus, 41
  - present theory, 41, 42
  - old theory, 41
- Nursing, 215
  - care of nipples and breasts, 215
  - diet during lactation, 214
  - frequency, 215
  - position of child, 215
  - qualifications for, 215
  - wet-nursing, management, 216

- Obliquely distorted pelvis, by coxarthrocace, 470
    - by synostosis, 470
  - heart-shaped uterus, 527
- Oblique positions, 398
  - classification, 398
  - course of labor, 406
  - complications, 410
  - diagnosis, 411
  - etiology, 402
  - frequency of each position, 401
  - hemorrhages in, 410
  - *natural version*, 407
  - prognosis, 415
  - *spontaneous version*, 407
  - *spontaneously induced version*, 407
  - *spontaneous evolution*, 408
  - tetanic contraction of uterus, 410
  - treatment, 416
- Obstetric—
  - bag, contents, 611
  - examination, 97
    - auscultation, 99
    - external, 97, 102
    - inspection, 97
    - internal, 102–107
    - mensuration, 100
    - palpation, 98
    - percussion, 99
    - per rectum, 104
  - operations, 601
  - abortion, induction of, 614
  - accouchement forcé, 735
- Obstetric—
  - anæsthesia, 610
  - brow presentation, correction of, 655
  - Cæsarean section, 722
  - cephalotripsy, 663
  - commencement of operation, 612
  - definition, 601
  - decapitation, 668
  - drugs, 611
  - episiotomy, 632
  - evisceration, 669
  - expressio fœtus, 677
  - expression of head, 679
  - extraction by shoulders, 679
    - by breech, 681
    - with cranioclast, 712
    - of arms, 685, 686
    - of after-coming head, 687
  - face presentation, correction of, 655
  - forceps, 692
  - frequency in hospital practice, 602
    - in private practice, 603
  - instruments, 611
  - laparotomy, 717
  - manikin, practice on, 603
  - os uteri, dilatation of, 634
    - perforation, 658
  - Porro operation, 727
  - position for operating, 605
  - placenta, removal of, 731
  - preparations, 605
  - premature labor, induction of, 619
  - prolapsed cord, reposition of, 672
  - prolapsed extremities, reposition of, 670
  - requirements, 604
  - vectis, 712
  - version, external, 637
  - combined, 639
  - internal, 641
- Occipito-posterior positions, 159, 311
  - causes, 391
  - diagnosis, 394
  - forceps in, 703
  - mechanism, 159
  - prognosis, 174, 395
  - symptoms, 391
  - treatments, 395
- Œdema in pregnancy, 82
  - cause, 82
- Oïdium albicans in vagina, 226
- Omphalotaxis, 380
- Operations on pregnant women, 334
- Ophthalmo-blennorrhœa neonatorum, 888
  - etiology, 889
  - prognosis, 889
  - symptoms, 889
  - time of onset, 888
  - treatment, 889
- Os uteri, artificial dilatation of, in labor, 634
  - external atresia and adhesion of, in labor, 547
    - etiology, 547

- Os uteri, external atresia,
    - diagnosis, 548
    - treatment, 548
- Osteophytes, 76
- Osteochondritis, characteristic of syphilis, 298
- Ostium vagina, lacerations of, in labor, 743
- Osteomalacia,
    - anxiety, effect upon, 481–483
    - climate, effect upon, 481–483
    - clothing, effect upon, 481–483
    - dwellings, effect upon, 481–483
    - diet, effect upon, 481–483
    - effect on pelvic bones, 479
    - lactation, effect upon, 481–483
    - labor, effect upon, 481–483
    - occupation, effect upon, 481–483
    - puerperium, effect upon, 481–483
- Osteomalacic pelvis, reossified, 471
- Ovaries, changes in during pregnancy, 44, 71
- Ovarian tumor, with symptoms of retroversion, 238
    - with pregnancy, 248
- Ovariotomy during pregnancy, 335
- Ovulation in pregnancy, 71
    - suspension of, during pregnancy, 71
- Ovum,
    - changes in, during first four weeks, 36–39
    - exit from tube, 34
    - membranes of, 39–44
    - of one month, 294
    - of fifth and eighth week, 45
    - of two months, 294
    - of third month, 46
    - passage through tube, 34
    - segmentation of, 37
    - size at fourteenth day, 37
    - stages of development, 38
    - first, second, third, fourth, fifth, 38
    - smallest described, 37
    - time of passing through isthmus tubæ, 35
        - loses power of conception, 34

- Pains, abnormal, 503
    - after, 135
    - expulsive, 135
    - faulty, as disturbance of labor, 503
        - spasmodic, 521
        - too strong, 515
        - weak, 503
    - premonitory, 135
    - preparatory, 135
    - shivering, 135
    - spasmodic, 521
        - etiology, 521
        - symptoms, 523
        - diagnosis, 523
        - treatment, 524
    - too strong, 515
        - definition, 515
        - etiology, 516
        - symptoms, 517
- Pains, too strong, prognosis, 518
        - treatment, 520
    - weak, 502
        - definition, 503
        - etiology, 504
        - symptoms, 506
        - diagnosis, 509
        - prognosis, 510
        - treatment, 511
- Palpation in pregnancy, 98
- Paralysis uteri, 504
- Paralyses in puerperium, 871
- Parametric exudations, with symptoms of retroversion, 238
- Parametritis in puerperium, 787
- Paresis uteri, 504
- Partus immaturus, fourth month, 295
        - fifth month, 296
- Parenchymatous mastitis, 858
- Parotitis during pregnancy, 251
- Pelvic abscess in puerperium, 787
        - pathology, 788
        - symptoms, 790
        - etiology, 792
        - diagnosis, 791
        - prognosis, 793
        - treatment, 793
    - cellulitis (see Pelvic Abscess), 787
    - exudations in puerperium (see Pelvic Abscess), 787
    - deformity as cause of oblique positions, 403
        - as cause of premature rupture of membranes, 339
        - as cause of prolapse of cord, 367
        - classification, 460
        - description of individual forms, 465
        - uniformly contracted pelvis, 465
        - simple narrow pelvis, 465
        - flat, or straight narrow pelvis, 466
        - simple, flat, non-rachitic pelvis, 466
        - rachitic flat pelvis, 466
        - generally contracted pelvis, 467
        - from spinal curvature (kyphoscoliotic), 468
        - from unilateral hip disease (coxalgic), 469
        - from asymmetry of sacrum (synostotic), 469
        - transversely contracted pelvis (Roberts), 471
        - irregularly compressed pelvis, 472
        - spondyl-olisthetic pelvis, 473
        - funnel-shaped and lumbo-sacral kyphotic pelvis, 475
        - narrowing from exostoses, tumors and fractures, 476
        - fissured pelvis, 477
            - definition, 461
            - diagnosis, 494
            - etiology, 478
            - forceps in, 499, 698

Pelvic deformity, fissured pelvis,
    frequency, 460
    symptoms, general, 483
    symptoms, special, 486
    treatment, 497
    presentation, 169
    abnormal mechanism, 171
    diagnosis, 169
    etiology, 172
  first pelvic position, 171
    diagnosis, mechanism, 171
    management, 185
    mechanism, 171
    prognosis, 175
  second pelvic position, 171
    diagnosis, mechanism, 171
  varieties, 169
Pelvimeters, 100
Pelvimetry, 100
Pelvis, as parturient canal, 138
  axes, 141
  bones of, 138
  cavity of, 138
  circumference of, 101
  deformity of, 457
  diameters of, 100
  "false," 138
  inclination of, 138
  inlet of, 139
  plana Deventeri, 466
  measurements of, 100
  outlet of, 139
Pendulous abdomen in pregnancy, 242
    at tenth month, 243
    in narrow pelvis, 242
    in occipito-posterior position, 242
Percussion in pregnancy, 99
Perforating scissors, 659
Perforation, 658
  history, 658
  indications, 559
  instruments, 659
  in pelvic deformity, 500
  operation, 661
  prognosis, 662
Pericystitis in puerperium, 865
Perimastitis, 857
Perineum, examination of in pregnancy, 102
  lacerations of, 738
    pathology, 738
    degrees, 738
    symptoms, 738
    etiology, 740
    prognosis, 741
    treatment, 742
  protection of, in labor, 183
    object, 183
    Fehling's method, 184
    French method, 184
    Goodell's method, 184
    Playfair's method, 184
Perineum, protection of,
    Ritgen's method, 184
    Smellie's method, 184
    Nicoli Bernati's method, 184
    Siebold's method, 184
  in vertex presentations, 183
  in posterior vertex positions, 185
  in face presentation, 185
  in pelvic presentation, 185
Periostitis of pelvis, 476
Peritoneum, changes in during pregnancy, 44
Peritonitic exudations in puerperal fever, 836
Peritonitis, puerperal, 794
Perspiration in puerperium, 206
Phenacetine for temperature in labor, 585
Phenomena of labor, 144
  of normal puerperium, 203
  of pregnancy, 68–94
Phlegmasia alba dolens in puerperium, 825
    pathology, 825
    symptoms, 827
    terminations, 828
    diagnosis, 828
    etiology, 829
    prognosis, 830
    treatment, 831
Phlegmon of nipple, 854
    symptoms, 854
    etiology, 855
    treatment, 856
Phlegmone cruralis, 828
    pathology, 828
    symptoms, 827
    terminations, 828
    diagnosis, 828
    etiology, 829
    prognosis, 830
    treatment, 831
  pelvis in puerperium, 787
Physiology of pregnancy, 33–39
  of labor, 129–176
  of puerperium, 197–213
Pigmentation of skin in pregnancy, 98
Pilocarpine in eclampsia, 597
Pityriasis versicolor in pregnancy, 83, 258
    cause, 83
    fungus of, 83
    symptoms, 83
    treatment, 128
  microsporon furfur in, 83
Placenta, abnormal situation of, 312
  artificial removal of, 721
    indications, 731
    preparations, 732
    operation, 732
    dangers, 734
  at fourth month, 47
  at fifth month, 47
  biloba, 56
  delivery of in normal labor, 191
  diseases of, as disturbances of pregnancy, 329

Placenta, diseases of,
            extravasations, 329
            thromboses, 330
            inflammations, 330
            tubercular placentitis, 330
            syphilis of, 330
    expulsion of in normal labor, 149
    falciform fold of, 60
    fenestrata, 56
    form of, 56
    formation of, 39
    in multiple pregnancy, 116
    marginata, 60
    prævia,
        as cause of prolapse of cord, 370
        artificial dilatation of os uteri in, 634
        as cause of oblique positions, 405
        cause of hemorrhage in, 319
        cause of death in, 322
        classification, 313
        definition, 312
        diagnosis, 321
        etiology, 314
        frequency of, 315
        induction premature labor in, 622
        prognosis, 321
        symptoms, 317
        time of hemorrhage, 318
        terminations, 320
        treatment, 323
        varieties, 312
    premature detachment of, 328
        causes, 328
        dangers, 328
        treatment, 329
    Schultze's fold of, 60
    situation of, 58
    size of, 58
    surfaces, 56
    succenturiata, 59
    syphilitic disease of, 299
    triloba, 56
    thrombosis of, as cause of labor, 132
    villi of, 57
    weight of, 56
Placental polypi, 296
Playfair, Partridge-Humphrey method in face presentations, 657
Playfair's method to protect perineum, 184
Plethora uteri, 505
Plumbic exudation in puerperal fever, 836
Pointed abdomen in pregnancy, 243
Polygalactia, 863
Polypi, decidual and placental, 777
        formation, 777
        appearances, 778
        symptoms, 778
        diagnosis, 779
        etiology, 779
        prognosis, 780
        treatment, 780
    fibrinous ("placental"), 296
Porro operation, 727
        history, 727
        indications, 727
        in uterine myomata, 540
        operation, 728
Position, of woman during operation, 605
        history, 605
        among ancients, 605
        Greeks, Romans, 605
        labor chair, 605
        oldest position, 605
        general requirements, 605
        transversely across bed, 606
            advantages, 606
            disadvantages, 606
        dorsal position, 607
            advantages, 607
            disadvantages, 607
        lateral position, 607
            advantages, 607
            disadvantages, 607
        ordinary position, 607
            advantages, 607
            disadvantages, 607
        knee-elbow position, 605
            first described, 605
    of fœtus, 84
        causes, 84
        definition, 84
        faulty of, 390
            etiology, 391
            symptoms, 391
            diagnosis, 394
            prognosis, 395
            treatment, 395
Post-partum hemorrhage, 575, 759
Posture, in labor, 181
        among ancients, 181
        history, 181, 182
Precipitate labor, 515 (see Pains).
Pregnancy, anæmia in, 260
    abdomen, pendulous in, 241
    affections of eyes in, 267
    anteversion and anteflexion in, 241
            symptoms, 242
            etiology, 243
            treatment, 244
    anatomy of, 33
    antisepsis during, 125–126
    auscultation in, 88–93
    cardiac diseases in, 263
    changes produced by, in mother, 68–78
            in uterus, 68
            in blood vessels, 69
            in lymphatics, 69
            in nerves, 69
            in peritoneum, 69
            in ligaments of uterus, 69
            in vagina, 71
            in external genitals, 71
            in Fallopian tubes, 71
            in ovaries, 71

- Pregnancy, changes produced by,
        - in abdomen, 71
        - in umbilicus, 71
        - in breasts, 72
        - in nipples, 73
        - in bladder, 74
        - in ureters, 74
        - in kidneys, 74
        - in intestines, 75
        - in spleen, 75
        - in stomach, 75
        - in liver, 75
        - in lungs, 75
        - in heart, 75
        - in diaphragm, 75
        - in skin, 76
        - in blood, 77
        - in urine, 77
        - in blood vessels, 77
        - in thorax, 76
        - in neck, 76
        - in thyroid gland, 76
        - in head, 76
        - in pulse, 78
        - in temperature, 78
        - in weight, 78
    - commencement of, possibilities, 35
    - definition of, 33
    - diagnosis of, 97
    - differential diagnosis of, 109
        - fat in abdominal walls, 109
        - distended bladder, 110
        - chronic metritis, 110
        - ovarian tumors, 110
        - hæmatometra, 110
        - retroversion, 111
        - retroflexion, 111
        - retro-uterine hæmatocele, 111
        - exudations, 111
        - para-metritis, 111
        - peri-metritis, 111
        - tumors, 111
    - diseases of fœtus in, 271
    - diseases of mother in, 223–270
    - disorders of mother in, 81
    - displacements of uterus in, 228
    - duration of, 93-93
    - examination for, 95
    - extra-uterine, 271 (see extra-uterine pregnancy)
    - gingivitis in, 251
    - gonorrhœal endometritis in, 227
    - hernia of uterus, 244
        - frequency, 244
        - etiology, 245
        - causes, 247
        - diagnosis, 247
        - prognosis, 247
        - treatment, 247
    - icterus during, 255
    - injuries during, 334
    - inversion of vagina in, 228
- Pregnancy,
    - management of, 123–125
        - nourishment, 123
        - clothing, 123
        - occupation, 124
        - care of skin, 124
        - preparation of genitals for labor, 124
        - care of breasts, 124
        - sleep, 125
        - exercise, 125
        - antiseptic precautions, 125
        - treatment of milder disorders, 126
    - measles in, 259
    - milder disorders of, 81
        - frequent micturition, 81
        - incontinence of urine, 81
        - constipation, 81
        - nausea, 82
        - vomiting, 82
        - heartburn, 82
        - longings, 82
        - languor, 82
        - fainting, 82
        - varicose veins, 82
        - œdema, 82
        - vertigo, fainting, 83
        - neuralgia, 83
        - pityriasis versicolor, 83
        - salivation, 83
        - treatment, 126–128
    - multiple, 114–120
        - occurrence, 114
        - manner of impregnation, 115
        - development of ovum, 116
        - symptoms, 120
        - diagnosis, 121
    - nervous system, affections of, 268
    - operations during, 334
    - ovarian tumors during, 248
        - symptoms, 248
        - diagnosis, 248
        - treatment, 249
    - parotitis in, 251
    - pathology and therapeutics, 223
        - classification, 223
        - disturbances of vulva, vagina and cervix, 226
        - displacements of the genitals, 228
        - prolapse of uterus, 229
        - retroflexion, retroversion, 233
        - anteversion, anteflexion, 241
        - hernia of gravid uterus, 248
        - ovarian tumor, 248
        - salivation, 250
        - gingivitis, 251
        - parotitis, 251
        - persistent vomiting, 252
        - affections of the liver, 255
        - typhoid fever, 257
        - pityriasis versicolor, 258
        - measles, 259
        - scarlatina, 259

- Pregnancy, pathology and therapeutics,
    - variola, 260
    - anæmia, 261
    - pulmonary tuberculosis, 261
    - cardiac diseases, 263
    - secondary syphilis, 265
    - affections of the eye, 267
    - affections of the nervous system, 268
    - extra-uterine, 271
    - hydrorrhœa uteri gravidi, 288
    - endometritis polyposa, 290
    - atrophy of decidua vera, 291
    - apoplexy of decidua vera, 292
    - abortion, 293
    - hydatiform or vesicular mole, 302
    - hydramnios, 306
    - small amount of liquor amnii, 210
    - amniotic adhesions, 310
    - abnormally situated placenta, 311
    - placenta prævia, 313
    - premature detachment of a normally situated placenta, 328
    - diseases of placenta and cord, 329
    - death of fœtus, 329
    - partus immaturus, 329
    - partus præmaturus, 329
    - injuries to and operations upon pregnant women, 334
  - physiology of, 33
  - pityriasis versicolor in, 258
  - prolapsus uteri in, 229
    - diagnosis, 230
    - etiology, 230
    - course and prognosis, 230
    - treatment, 231
  - physiology and management of, 33
  - *Anatomy and physiology*:—
    - definition, commencement of pregnancy, time and site of impregnation, 33
    - impregnation and changes in ovum in first month, 36
    - formation of placenta, membranes of ovum, first changes in uterus and adjacent organs, 39
    - further changes in embryo and membranes, 45
    - the fully developed child, 51
    - the umbilical cord, 54
    - the placenta, 56
    - the liquor amnii, 62
    - nutrition and metabolism of embryo and fœtus, 65
    - further changes in uterus and external genitals, 68
    - changes in other organs of the body, 74
  - *Symptomatology of pregnancy*:—
    - appearance of genitals in different months, 79
    - milder disorders of pregnancy, 81
- Pregnancy—*Symptomatology of pregnancy*;
    - position of child in utero, 84
    - auscultatory phenomena, 88
    - duration of pregnancy, 93
  - *Examination of pregnancy and its diagnosis*:—
    - general remarks, obstetric history, 95
    - the obstetric examination, 97
    - relative value of the different signs of pregnancy, 107
    - differential diagnosis of, 109
    - diagnosis between primipara and multipara, determination of exact period of pregnancy, and size of child, 112
  - *Multiple pregnancy*:—
    - occurrence, manner of impregnation, development of ovum, 114
    - symptoms and diagnosis of twin pregnancy, 120
  - *Management af pregnancy*:—
    - nourishment, clothing, occupation, care of skin, preparation of genitals for labor, and puerperium, 123
    - antiseptic precautions, 125
    - treatment of the milder disorders of pregnancy, 126
  - pulmonary tuberculosis in, 261
  - retroflexion and retroversion, 234
    - etiology, 234
    - diagnosis, 237
    - prognosis, 239
    - terminations, 237
    - symptoms, 234
    - pathology, 236
    - treatment, 239
  - scarlatina in, 259
  - secondary syphilis in, 265
  - signs of, 107–109
  - site of fecundation, 35
  - time of, 112
  - time of fecundation, 34
  - typhoid fever in, 257
    - treatment, 258
  - twin, 120
  - vaginitis in, 227
  - vomiting of, 252
    - terminations, 253
    - etiology, 253
    - prognosis, 254
    - treatment, 254
  - vulvitis in, 226
  - with ovarian tumor, 248
    - pathology, 248
    - diagnosis, 248
    - treatment, 249
- Premature and mature labor, artificial separation of placenta in, 732
      - indications for, 619
      - induction of methods, 619

- Premature labor,
  - induction of in uterine myomata, 540
  - treatment of, 333
- Preparatory operations, 614
- Presentation of fœtus, 84
  - causes of, 84
  - definition, 84
  - faulty, 397
  - faulty, as cause of prolapsed cord, 368
  - frequency of each, 154
  - prognosis of each, 174
- Primitive groove, 38
  - trace, 37
- Primipara, diagnosis of, 112
- Prochownick's method of placental delivery, 192
- Prolapse of small parts, in premature rupture of membranes, 341
- Prolapsed cord, forceps in, 697
  - reposition of, 672
    - object, 672
    - indications, 672
    - conditions, 673
    - reposition, manual, 673
    - reposition, postural, 674
    - reposition, instrumental, 675
  - extremities, reposition of, 670
    - object, 670
    - indications, 671
    - contra-indications, 671
    - preparation of women, 671
    - operation, 672
    - prognosis, 672
- Prolapsus uteri during pregnancy, 229
  - symptoms, 229
  - diagnosis, 230
  - etiology, 230
  - course, 231
  - prognosis, 230
  - treatment, 231
  - illustrative case, 232
- Pronuclei, male, female, 36
- Prostration, forceps in, 697
- Puberty, 33
- Puerperal fever, etiology, 840
  - history, 841
  - starting point, 843
  - local affection, 843
  - retained membranes, 844
  - in private practice, 844
  - blennorrhœa, 844
  - wounds and contusions, 844
  - soil, 845
  - reasons, 845
  - city, country, 845
  - maternities, 845
  - examining fingers, 845
  - air of maternities, 845
  - ventilation, 846
- Puerperal fever,
  - atmosphere, 847
  - linen of patients, 847
  - physician's clothing, 847
  - character of virus, 848
  - cadaverin,
  - microbes, 849
  - self-infection, 850
  - infected midwives, 851
  - antisepsis, 852
  - prevention of, 125
  - septic form, 794 (see Puerperal peritonitis)
  - venous form, 811
  - pathology, 812
  - symptoms, 817
  - diagnosis, 820
  - etiology, 821
  - prognosis, 822
  - treatment, 823
- peritonitis, 794
  - pathology, 796
  - symptoms, 799
  - terminations, 802
  - diagnosis, 803
  - prognosis, 804
  - etiology, 804
  - treatment, 805
- state,
  - "after pains" in, 208
  - bed, care of, 214
  - bladder, care of, 214
  - bowels, care of, 215
  - changes in breasts, 201
    - in genitals, 197
    - in intestines, 207
    - in blood, 201
  - definition, 197
  - diet of, 214
  - diagnosis of, 210
  - drugs, use of, in, 215
  - lying in room, character of, 213
  - management of, 213
  - menstruation in, 209
  - nursing, 215
  - pathology and therapeutics of, 737
- *Wounds of the genitals*, 737
  - lacerations of perineum, 737
    - of the external genitals and ostium vaginæ, 743
  - lesions of vagina, 744
  - lacerations of vaginal vault and uterus, 747
  - depression and inversion of uterus, 751
  - external hemorrhages, 759
  - internal hemorrhages, 771
  - decidual polypi and uterine hæmatoma, 777
  - inflammation and ulcers of external genitals and vagina, 781
  - colpitis, 785

- Puerperal state,
  - endometritis, 785
  - metritis, 787
  - parametritis, 787
  - phlegmone pelvis, 787
  - puerperal peritonitis, 794
  - venous thrombosis, 811
  - metastatic pyæmia, 811
  - phlegmasia alba dolens, 825
  - phlegmone cruralis, 825
  - erysipelas, external and internal, 832
  - etiology of puerperal fever, 840
  - *Diseases of the breasts*, 854
    - diseases of the nipples, 854
    - perimastitis, 857
    - parenchymatous and lobular mastitis, 858
    - anomalies in milk secretion, 861
  - *Diseases of the non-sexual organs*, 865
    - diseases of urethra and bladder, 865
    - inflammation of ureter and renal pelvis—pyelitis, 867
    - affections of the pelvic articulations, 868
    - neuralgias and paralyses of the lower limbs, 871
    - puerperal tetanus, 873
    - mental diseases of puerperal women, 874
    - skin diseases of puerperal women, 878
    - sudden death in puerperal women, 879
    - peculiarities of, 213
    - phenomena of, 203
    - physiology and management of, 197
      - definition, 197
      - changes in genitals, 198
        - in breasts, 201
      - phenomena of, 203
      - diagnosis of, 210
      - changes in child, 211
      - management of woman, 213
        - of infant, 218
      - temperature, 203
      - pulse, 203
      - vital capacity, 204
      - skin, 206
      - urine, 206
      - intestines, 207
      - weight, 207
      - subjective phenomena, 208
      - after-pains, 208
      - menstruation returns, 209
    - pulse, changes in, 204
    - quality of milk secretion, 216
    - temperature, changes in, 203
    - urine, changes in, 207
    - vaginal injections in, 215
    - weight, changes in, 208
- Pulmonary tuberculosis in pregnancy, 261
- Pulse, changes in during pregnancy, 78
- Pulse, changes in during puerperium, 204
  - effect after pains on, 204
  - causes lessening, 205
  - of aorta in pregnancy, 89
- Purgatives in puerperal peritonitis, 807
- Pyæmia, metastatic, in puerperium, 811
- Pyelitis in puerperium, 867
- Pyopagus monster, 453

- Quadruplets, 119
- Quintuplets, 119
- Quinine in puerperal fever, 824
  - in weak pains, 512
- Quickening, first felt, 48

- Rachitic, flat, double promontory pelvis, 467
  - asymmetrical pelvis, double promontory, 469
- Rachitis, effect on pelvic bones, 478
  - fœtal, 479
    - pathology, 478
    - effect of drugs on, 479
- Recent deliveries, signs of, 210
- Rectum, examination by, in pregnancy, 104
- Reproduction, power of, 33
  - relation to ovulation and menstruation, 33
  - relation to climate, 33
- Reproductive power established, 33
- Resistances in labor, 138
  - bony pelvis, 138
  - cervix, 141
  - fœtal head, 142
  - soft parts, 141
  - vulva, 141
- Retained placenta, 570
  - definition, 570
  - diagnosis, 572
  - etiology, 571
  - treatment, 731
- Retroflexion of gravid uterus,
  - indication for abortion, 616
  - and retroversion in pregnancy, 233
    - definitions, 233
    - etiology, 234
    - symptoms, 234
    - pathology, 236
    - terminations, 237
    - diagnosis, 237
    - differential diagnosis, 238
    - prognosis, 239
    - treatment, 239
- Retroversion of pregnant uterus, 233
  - induction of abortion in, 617
  - indication for abortion, 616
- Rheumatism of uterus, 505
- Ribs, embryonic, 46
- Ritgen's method in weak pains, 514
  - of extraction, 184

Round ligaments, changes in, during pregnancy, 69
Rubber pelvis, 593
Rupture of membranes, artificial,
        in weak pains, 511
    of uterus, 558
        diagnosis, 567
        etiology, 558
        frequency, 563
        laparotomy in, 721
        prognosis, 568
        symptoms, 567
        treatment, 569
Ruptured Graafian follicle, changes in, during pregnancy, 44

Sacral region, fœtal, faulty conditions of, 442
        course of labor, 445
        prognosis, 445
        treatment, 446
Sänger's method for Cæsarean section, 725
Salivation during pregnancy, 250
        cause of, 83
        treatment, 250
Scarlatina during pregnancy, 259
Schatz's method in face presentation, 656
Schöller's omphalosoter, 675
Schroeder's method of placental delivery, 193
Schultze's fold of placenta, 60
Sclerema neonatorum, 899
        causes, 899
        treatment, 900
Scrotum, fœtal, first appearance, 46
Secondary syphilis in pregnancy, 265
            symptoms, 265
            treatment, 266
Secretions of breasts, 49
Segmentation of yelk, 37
Self-infection in puerperal fever, 850
Serous cystitis in puerperium, 865
Shape, faulty, of fœtus, as disturbance of labor, 419
    hydrocephalus, 419
    hydromeningocele, hydrencephalocele, intrafœtatio capitis, 427
    faulty conditions of neck, 429
            of thorax, 433
            of abdomen, 436
            of sacral region, 442
Shoulders, fœtal, unusual breadth of, as obstruction to labor, 433
        diagnosis, 434
        symptoms, 433
        prognosis, 434
        treatment, 435
Sickle-shaped decapitator, 668
Signs of pregnancy, 107–109
        breast changes, 108
        cessation of menstruation, 107
        certain, 107
Signs of pregnancy,
        color of vulva, vagina and cervix, 107, 108
        doubtful, 107
        fœtal heart sounds, 109
        feeling of the fœtus, 108
        movements of fœtus, 109
        probable, 107
        striæ, 108
        umbilical murmur, 109
        uterine murmur, 108
        umbilical changes, 108
Simpson's method in placenta prævia, 327
    forceps, 704
Skin, changes in, during pregnancy, 76, 77
    value of, 108
    changes in, during puerperium, 206
    diseases of, in puerperium, 878
Sling-carrier in version, 649
    Rosenberg's, 684
    use of, in version, 649
Soft parts, disturbances of, during labor, 553
        cystocele vaginalis, 554
        hæmatomata, 556
        retro-uterine hæmatocele, 553
        vaginal enterocele, 555
        diseases of, as indication for induced abortion, 616
        rigidity of, in labor, 549
        resistance of, in labor, 141
        stenosis of, in labor, 549
        swelling of, in labor, 549
        swelling, stenosis, rigidity of, in labor, 549
            causes, 550
        complications, 550
        treatment, 551
Somatopleure, 61
Sounds, blowing, in pregnancy, 89
    crepitating, in pregnancy, 89
    friction, in pregnancy, 89
    fœtal heart, 89
    heart of gravida, 89
    intestinal, in labor, 89
Spasmodic pains, 521
        causes, 521
        definition, 521
        diagnosis, 523
        prognosis, 523
        symptoms, 523
        strictura uteri, 522
        tetanus uteri, 522
        treatment, 524
        in a restricted sense, 524
            definition, 524
            diagnosis, 525
            symptoms, 524
            treatment, 525
Specific gravity of different fœtal organs, 50
Speculum, use of, in pregnancy, 104
Spermatic fluid, vitality of, 34
Spermatozoa, motion of, 35

Spermatozoa, place of meeting ovule, 35
  rate of motion, 35
  vitality, 35
Spina bifida in fœtus, 443
Spinal cord, diseases of, complicating labor, 582
  disease complicating labor, 583
  column, inspection of, in pregnancy, 100
Spines of ilia, distance between, 100
Spleen, fœtal, tumors of, 437
  changes in, during pregnancy, 75
  maternal, erysipelas of, 838
  rupture of mother's, in labor, 580
Spontaneous evolution, 408
  version, 407
Spontaneously induced version, 407
Sponge tents in induced labor, 628
Spondyl-olisthetic pelvis, 474
Spoon for removing fragments of placenta, 733
Sprue in newborn, 890
    causes, 890
    diagnosis, 891
    symptoms, 891
    treatment, 891
Stages of labor, 144
Staphylococcus pyogenes aureus in puerperal fever, 849
    albus in puerperal fever, 849
Stenosis, rigidity, swelling of soft parts in labor, 549
Stomach, changes in, during pregnancy, 75
Strepinus uterinus, 88
Streptococcus erysipelas in puerperal fever, 849
  pyogenes in puerperal fever, 849
Striæ gravidorum, 71
Stumpf's dietary in puerperium, 214
Strictura uteri, 522
Struma congenita, 431
Strychnia in weak pains, 515
Sucking sounds of fœtus in labor, 92
Sudden death, in puerperium, of puerpera, 879
    embolism of pulmonary artery, 879
    entrance of air into uterus, 880
    organic heart disease, 881
    paralysis of the heart, 881
    violent emotional excitement, 881
    in labor, of gravida, 597
      causes, 597
Sugar in urine in puerperium, 207
Sulphuric ether in labor. 187
Sulfonal in puerperium, 878
Superfecundation, 115
Superfœtation, 115
Sutures of fœtal head, 51, 142
Symptomatic puerperal mania, 874
Symptoms of pregnancy, 79, 107
  certain, 107
  doubtful, 107
  in different months, 79
Symptoms of pregnancy,
  probable, 197
  relative value of, 107
Symphysiotomy, 730
Syphilis, induction of premature labor in, 622
  secondary, in pregnancy, 265

Tabes dorsalis, labor in, 583
Tampon for inducing labor, 627
  in placenta prævia, 324
  in puerperal hemorrhage, 769
  of vagina in abortion, 300
  as indication for forceps, 697
Temperature during labor, 152
  during puerperium, 203
  in pregnancy, 78
  of fœtus, 66
Tents, for inducing labor, 628
  in weak pains, 511
Tetanus neonatorum, 897
  puerperal, 873
  uteri, 522
Thebaica in precipitate labor, 520
  hemorrhage in, 575
Third stage of labor, treatment, 189
Thoracopagus monster, 453
Thorax, changes in during pregnancy, 76
  fœtal, faulty conditions of, 433
Thrombosis of vulva and vagina, 771
Thyroid gland, changes in during pregnancy, 76
Tocodynamometer, 135
Too strong pains, tumultous pains, precipitate labor, 515
      consequences, 517
      definition, 515
      etiology, 516
      symptoms, 517
      treatment, 520
Transfusion in placenta prævia, 326
  in puerperal hemorrhage, 770
Tricephalus monster, 455
Trichomonas vaginalis, in vagina, 226
Triplets, 119
  arrangement of appendages, 119
  cause, 119
  diagnosis, 120
  frequency, 114
  symptoms, 120
Trismus neonatorum, 897
Trochanters, maternal, distance between, 102
Tubal pregnancy, with symptoms of retroversion, 238
Tuberculosis, pulmonary, during pregnancy, 261
Tumultuous pains, 515
Twin deliveries, as cause of oblique positions, 404
  labor, management of, 194
  pregnancy, 120
    arrangement of appendages, 119

- Twin pregnancy,
    - causes, 119
    - diagnosis, 120
    - frequency, 114
    - kidney of pregnancy in, 120
- Typhoid fever in pregnancy, 257
- Tyrosin in urine, in eclampsia, 590

- Ulcers, of nipple, 854
    - of external genitals and vagina in puerperium, 781
- Umbilical cord,
    - abnormal length of, 352
        - effect on pregnancy, 353
        - effect on labor, 353
    - abnormal insertion of, 346
        - varieties, 346
        - velamentous insertion, 347
        - bifurcated insertion of, 351
        - causes, 347
        - symptoms, 349
        - diagnosis, 351
        - prognosis, 351
        - treatment, 351
    - bifurcated insertion of, 351
    - diseases of, as disturbances of labor, 330
        - stenosis, 330
        - fibrous cords, 331
        - tubercles of, 331
    - excessive length of, as cause of prolapse, 369
    - faulty form and vascular arrangement of, 345
    - knots of, 353
        - effect on pregnancy, 353
        - effect on labor, 353
    - insertion of, 55
    - insertio furcata, 55
    - insertio velamentosa, 55
    - interlacing and knotting in twin labors, 448
        - course of labor, 448
        - manner of interlacing, 449
        - etiology, 450
        - diagnosis, 450
        - treatment, 450
    - new growths of, 365
        - cysts, 365
        - hydatids, 366
        - myxoma, 366
    - parenchymatous changes in, 364
        - varices, 364
        - œdema, 364
        - extravasations, 364
        - strictures, 364
        - new connective tissue, 364
    - presentation and prolapse of, 366
        - definition, 366
        - history, 366
        - etiology, 367
- Umbilical cord, presentation,
        - diagnosis, 372
        - symptoms, 373
        - prognosis, 376
        - treatment, 378
        - frequency, 371
        - seat of prolapse, 371
    - rupture and hæmatoma of, 361
        - effect on child, 362
        - effect on mother, 362
        - diagnosis, 363
        - treatment, 363
    - spirals of, 55
    - shortening by coiling, 356
        - frequency, 356
        - dangers, 357
        - diagnosis, 357
        - etiology, 358
        - prognosis, 358
        - treatment, 359
    - too short cord, 354
        - frequency, 355
        - effect on pregnancy, 355
        - effect on labor, 355
    - valves of, 54
    - velamentous insertion of, 347
    - vessels of, 54
    - diseases, of newborn, 893
    - simple inflammation, 893
        - symptoms, 893
        - treatment, 894
    - fungus umbilicalis, 893
        - symptoms, 893
        - treatment, 894
    - erysipelas of ring, 894
        - causes, 894
        - terminations, 894
        - treatment, 894
    - arteritis phlebitis, 894
        - causes, 894
        - symptoms, 895
        - treatment, 895
    - hemorrhage from ring, 895
        - causes, 895
        - treatment, 895
    - hernia of umbilical cord, 895
        - pathology, 895
        - treatment, 896
    - murmur, auscultation for, 99
        - value as sign of pregnancy, 109
    - souffle, 99
    - vesicle, 47
    - vessels, in twins, 118
    - vein, stenosis as cause of abortion, 299
- Umbilicus, changes in during pregnancy, 71
    - value of these changes, 108
- Ureters, changes in during pregnancy, 74
- Urethra, diseases of, in puerperium, 865
        - symptoms, 866
        - diagnosis, 866
        - causes, 866
        - treatment, 867

- Urine, changes in during pregnancy, 77
    - labor, 153
    - puerperium, 206
- Uterus bicornis, 531
    - contractions of, 133
    - carcinoma of, as disturbance of labor, 542
        - frequency, 542
        - symptoms, 542
        - air-embolism in, 543
        - diagnosis, 544
        - prognosis, 544
        - treatment, 545
    - changes in during pregnancy, 68
        - muscular fibres, 68
        - blood vessels, 69
        - perineum, 69
        - during puerperium, 197–200
    - depression and inversion of, in labor, 751
        - pathology, 752
        - symptoms, 753
        - diagnosis, 754
        - etiology, 755
        - prognosis, 757
        - treatment, 757
    - faulty state of as cause of prolapse of cord, 367
    - faulty development of, as disturbance of labor, 526
        - uterus unicornis, 527
        - uterus bicornis, 526-531
        - hernia uteri bicornis, 527
        - hollowed-out above, 527
        - anvil-shaped, 527
        - obliquely heart-shaped, 527
        - uterus septus, 528
        - complications, 530
        - course of labor, 531
        - treatment, 532
    - hemorrhage from, in puerperium, 761
    - inflammation of, in puerperium, 787
        - pathology, 788
        - symptoms, 790
        - diagnosis, 791
        - etiology, 792
        - prognosis, 793
        - treatment, 793
    - lacerations of, in labor, 556
        - etiology, 558
            - spontaneous, 558
            - violence, 560
            - instruments, 560
        - position of, 560
        - character, 561
        - occurrence, 563
        - frequency, 563
        - symptoms, 564
        - diagnosis, 567
        - prognosis, 568
        - treatment, 569
    - muscular neoplasms of, as disturbance of labor, occurrence, 536
- Uterus, muscular neoplasms of,
        - frequency, 534
        - effect on labor, 536
        - course of labor, 538
        - diagnosis, 539
        - prognosis, 539
        - treatment, 540
    - prolapse of, during pregnancy, 229
    - septus, 528
    - shape of, in pelvic deformity, 486
    - unicornis, 527

- Vagina,
    - disturbances of, in pregnancy, 226
    - examination of, in pregnancy, 102
    - faulty development of, in labor, 526
            - vagina septa, 531
        - ligamentum recto-vesicale, 531
            - treatment, 532
    - hemorrhage from, in puerperium, 760
    - inflammation of, in puerperium, 784
        - pathology, 785
        - symptoms, 785
        - etiology, 786
        - prognosis, 786
        - treatment, 787
    - influence upon expulsion of fœtus, 137
    - inversion of, during pregnancy, 228
    - in pregnancy, 71
    - lesions of, in labor without perforation, 744
        - pathology, 744
        - symptoms, 744
        - terminations, 745
        - diagnosis, 745
        - prognosis, 746
        - treatment, 746
    - neoplasms, as obstructions to labor, 551
        - connective tissue tumors, 551
        - muscular tumors, 551
        - cysts, 552
        - hydatid cysts, 552
- Vaginal vault and uterus,
    - lacerations of during labor, 747
        - pathology, 747
        - symptoms, 748
        - diagnosis, 749
        - prognosis, 750
        - treatment, 750
- Vagitus uterinus, 92
- Valves of Hobokenius, 54
- Varicose veins in pregnancy, 82
    - cause of, 82
- Varicosities, forceps in, 697
- Variola during pregnancy, 260
- Vectis, 712
- Veit-Smellie's method of extraction, 689
    - J., method for Cæsarean section, 725
- Venous thrombosis in puerperium, 811
- Version in pelvic deformity, 501
    - in uterine myomata, 541

Version in prolapse of the cord, 379
  by external manipulation, 637
  combined indirect, 639
  combined direct, 641
Vertex presentations, forceps in, 699
    faulty mechanism, 391
    first vertex position, 155
      mechanism, 155
      diagnosis, 155
    second vertex position, 158
      diagnosis, 158
      abnormal mechanism, 158
    occipito-posterior position, 158
      prognosis. 174
Vertigo in pregnancy, 82
      cause of, 82
Vesical calculi in labor, 559
  pregnancy, 280
Vesicular mole, 302
  respiratory murmur of women in pregnancy, 89
Vestibule, hemorrhage from, in puerperium, 760
Vital capacity during puerperium, 206
Villi, placental, 57
Vitelline duct, 37
Vomiting, persistent, during pregnancy, 253
        stages, 253
        terminations, 253
        etiology, 253
        prognosis, 254
        treatment, 254
Von Voit's dietary, 214

Vulva, disturbances of, during pregnancy, 226

Weak labor pains, 503
    definition, 503
    ***inertia uteri*, 504**
    ***atonia uteri*, 504**
    ***paralysis uteri*, 504**
    ***hemiparesis uteri*, 504**
    ***paresis uteri*, 504**
    etiology, 504
    ***plethora uteri*, 505**
    ***rheumatism of uterus*, 505**
      symptoms, 506
      diagnosis, 509
      prognosis, 510
      treatment, 511
    forceps in, 697
Weight during pregnancy, 78
  during puerperium, 207
Wet-nurse, qualifications, 216
  selection of, 217
Wharton's jelly, 54
Wigand-A. Martin's method of extraction, 690
Winckel's disease of newborn, 898

Xyphopagus monster, 453

Zona pellucida, 36

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